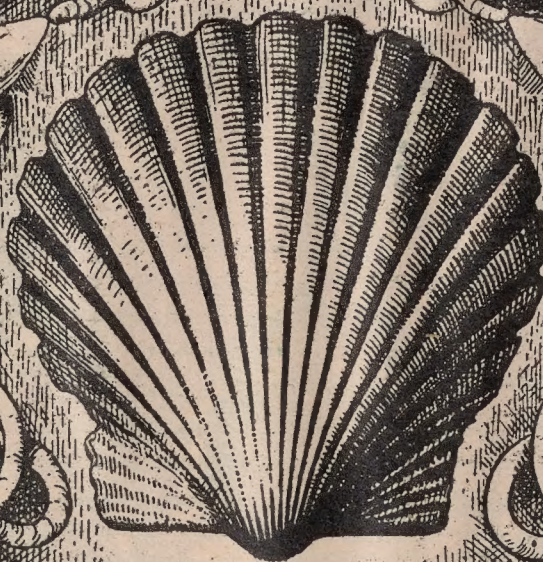


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THE

JOURNAL OF CONCHOLOGY:

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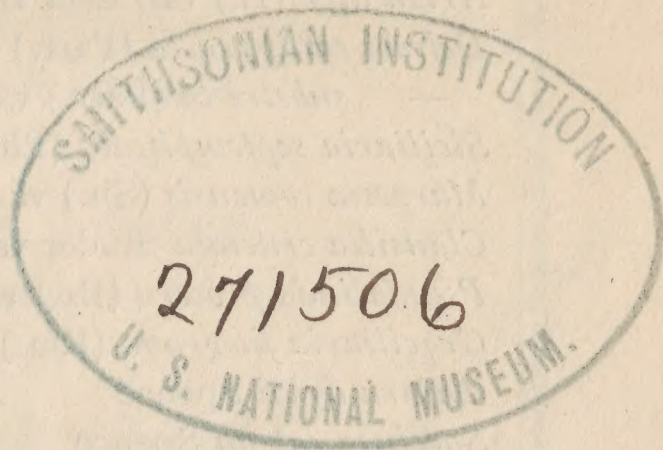
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- 33, ten lines from bottom for "rood" read "road."
 46, line 17 , "f." read "sp."
 73, eight lines from bottom for "Sterhi" read "Sterki."
 84, line 11 for "sen" read "seu."
 204, footnote 2 for "snd" read "and."

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1919. Matthews, John Hugoe, 6, York Road, Chorlton-cum-Hardy, Manchester.
1889. Mayfield, Arthur, F.C.S., Mendlesham, Stowmarket, Suffolk.
1914. Mazyck, W. G., Hon. Curator, Charleston Museum, S. Carolina, U.S.A.
1903. McClelland, Hugh, The Manor House, Berkswell, near Coventry.
1880. *P* Melvill, James Cosmo, M.A., D.Sc., F.L.S., Meole Brace Hall, Shrewsbury.
1919. Moore, Alfred A., 34, Lincoln Street, Norwich.
1902. *L* Moore, Chas. H., 103, Mottram Road, Stalybridge.
1907. Morey, Frank, F.L.S., Wolverton, Carisbrooke Rd., Newport, Isle of Wight.
1917. Morley, John, A.M.I.Inst.E., 2, Clarence Villas, Ashburton Road, Trafford Park, Manchester.
1918. Mückardt, Harald, Drottninggatan, 11, Helsingborg, Sweden.
1907. Musham, J. F., F.E.S., Bella Vista, Mount Pleasant, Greenodd, Ulverston.
- .
1911. Nash, Rev. E. H., M.A., Wetley Rocks Vicarage, Stoke-on-Trent.
1918. Nelson, Geo., 38, Griffiths Street, Falkirk, Stirlingshire.
1918. *L* Nevill, Rev. Ralph William, M.A., Beighton Rectory, Norwich.
1891. *P* Newton, Richard Bullen, I.S.O., F.G.S., 328, Uxbridge Rd., London, W. 3.
1919. Nordgaard, O., Director of the Biological Station, Trondhjem, Norway.
1919. Odam, Charles Leslie, B.A., M.R.C.S., L.R.C.P., 91, Breakspeares Road, Brockley, Kent.
1887. *L* Oldham, Chas., F.L.S., F.Z.S., The Bollin, Shrublands Rd., Berkhamsted.
1910. * Oliver, A. M., Thorney Close, Fenham, Newcastle-on-Tyne.
1896. *L* Overton, Harry, The Newlands, Boswell Road, Sutton Coldfield.
1923. Owen, Giles, 54, Townfield Lane, Barnton, Northwich, Cheshire.
1904. Parritt, H. W., 14, Stanhope Gardens, Highgate, N.
1886. Pearce, Rev. S. Spencer, M.A., Steepleton Rectory, near Dorchester.
1921. Peile, Lt.-Col. A.J., R.A., 18, Leopold Road, Wimbledon, S.W. 19.
1913. *L* Pellow, N. E., The Homestead, Arrow, Alcester, Warwickshire.
1918. Perry, Edmund E., 6, Stuart Crescent, Wood Green, London, N. 22.
1908. Phillips, R. A., Ashburton, Cork.
1897. Preston, Hugh B., F.Z.S., Hôtel Savoia, Alassio, Liguria, Italy.
1921. Price-Jones, Cecil, M.B., The Medical School, University College Hospital, University Street, London, W.C. 1.
1907. Priske, R. A. R., 9, Melbourne Avenue, West Ealing, Middlesex.
1906. *L* Pritchard, G. B., F.G.S., 38, Mantell Street, Moonee Ponds, Victoria.
1916. Pye, Alfred W., The Hollies, Dudley Street, Grimsby.
1916. Quick, Capt. Hamilton E., M.B., F.R.C.S., "Varfell," 130, Eaton Crescent, Swansea.
1906. *L* Radley, Percy E., F.R.M.S., Nesta, Station Road, Broxbourne, Herts.
1913. Rhodes, F., 113, Heaton Road, Manningham, Bradford, Yorks.
1900. Richards, C. P., Mission House, Stenalees, St. Austell, Cornwall.
1898. Roberts, A. William Rymer, The End House, 38, Fulbrook Rd., Cambridge.
1921. Robertson, Miss Jessie D., 9, Buckingham Mansions, West End Lane, N.W. 6.

1918. Robins, E. A., Gorran, Cassiobury Park Avenue, Watford.
 1922. Robson, Guy C., M.A., F.Z.S., British Museum (Nat. Hist.), Cromwell Road, London, S.W. 7.
 1901. * Rooth, J. A., M.R.C.S., 1, Goldsmid Road, Brighton.
 1893. Roseburgh, John, Market Square, Galashiels, Selkirkshire.
 1910. *L* Rowe, A. W., M.S., M.B., M.A.C.S., F.G.S., Shottendane, Margate.
1914. Saban, Alfred J., 73, Rye Hill Park, Peckham Rye, S.E. 15.
 1906. *L* Salisbury, Albert E., 12a, The Park, Ealing, W. 5.
 1921. Saunders, J. H. D., 14, Warwick Avenue, Paddington, London, W. 2.
 1877. *P* Scharff, Robert F., Ph.D., M.R.I.A., Knockranny, Bray, co. Wicklow.
 1895. *L* Schill, C. H., Crosten Towers, Alderley Edge.
 1918. *L* Schlesch, Hans, Strandagervej 26, Hellerup, Denmark.
 1910. *L* Shaw, H. O. N., B.Sc., F.Z.S., 112 & 114, Wardour Street, London, W. 1.
 1904. Shaw, Rev. W. A., Peper Harow Rectory, Godalming.
 1910. Shrubsole, George, Elm Bank, Workington, Cumberland.
 1895. *L* Sich, Alfred, F.E.S., Corney House, Chiswick, W. 4.
 1905. Simpson, James, 23, Marischal Street, Aberdeen.
 1902. Smallman, Raleigh S., Eliot Lodge, Albemarle Road, Beckenham.
 1899. *L* Smith, Mrs. Lucy A., Cricklade Street, Cirencester.
 1907. Smith, Maxwell, Hartsdale, Westchester Co., New York, U.S.A.
 1894. Smith, Wm. Chas., 92, Dawes Road, Fulham, S.W. 6.
 1900. Solly, E. H., Lea Orchard, Ottinge, Elham, near Canterbury.
 1917. Sowden Harry, Hon. Recorder, York and District Field Naturalists, 22, Victoria Street, Nunnery Lane, York.
 1907. Spence, G. C., 10, Pine Grove, Monton, Eccles, Lancs.
 1914. Stainton, Ernest, 70, Jubilee Road, Doncaster.
 1906. Stalley, Henry J., Thorntona, Oxted, Surrey.
 1886. *P* Standen, Robert, The Museum, The University, Manchester.
 1919. Stanley, Frederick, "Hanover," Addiscombe Road, Margate.
 1915. Steenberg, C. M., Mag. Sc., Petersborgvej, 6¹, Copenhagen.
 1903. *L* Stelfox, A. W., M.R.I.A., Mayfield, 14, Clareville Road, Rathgar, Dublin.
 1918. Stephens, G. A., F.L.A., City Librarian, The Public Library, Norwich.
 1910. Stephenson, H. L., 90, Tempest Road, Beeston Hill, Leeds.
 1908. *L* Stobart, H. J. S., Belbroughton, Stourbridge.
 1897. Stracey, Bernard, M.B., Châlet Dunbeg, Diemtigen, Simmenthal, Canton Bern, Switzerland.
 1890. Stubbs, Arthur Goodwin, The Meads Cottage, Hailey Lane, Hertford.
 1920. Sundler, Berthold, Borås, Sweden.
 1895. *P* Swanton, E. W., A.L.S., The Educational Museum, Haslemere, Surrey.
 1888. *P* Sykes, Ernest Ruthven, B.A., F.L.S., Lewell Lodge, Dorchester.
1910. Tattersall, Prof. W. M., D.Sc., Zoology Dept., University College of S. Wales, Cardiff.
 1895. Taylor, Fred, 42, Landseer Street, Park Road, Oldham, Lancs.
 1904. *L** Taylor, Gerald Medland, Rossall School, Fleetwood.
 1903. Thaanum, D., Box 746, Hilo, Hawaiian Islands.
 1907. *L* Thornton, H. G., Kingsthorpe Hall, Northampton.
 1886. *P**L* Tomlin, J. R. le B., M.A., F.E.S., "Fairfield," Boscobel Road, St. Leonards-on-Sea.
 1906. Turton, Lt.-Col. W. H., D.S.O., R.E., 21, Sion Hill, Clifton, Bristol.

1907. Upton, Charles, Rooksmoor, Tuffley Avenue, Gloucester.
1914. Van der Sleen, Dr. W. G. N., Laurens Cortesstraat, 23, Haarlem, Holland.
1915. Van Hyning, T., Curator, Florida State Museum, Gainesville, Fla., U.S.A.
1899. Vaughan, J. Williams, J.P., The Skreen, Erwood, Breconshire.
1897. Vignal, Louis, 28, Avenue Duquesne, Paris.
1902. Vincent, W. C. W., 39, West Bank, Stamford Hill, N. 16.
1898. Wakefield, H. Rowland, 7, Montpelier Terrace, Swansea.
1891. Walker, Bryant, 1306, Dime Bank Building, Detroit, Michigan, U.S.A.
1920. Ward, Arthur Wadams, 12, Britannia Square, Worcester.
1900. *L* Watson, Hugh, M.A., Bracondale, The Avenue, Cambridge.
1921. Watson, Leslie S.V., 32, Granville Road, Stroud Green, London, N. 4.
1908. Weaver, G. H., 31, Devonshire Road, Palmer's Green, N.
1900. Webb, Walter F., 202, Westminster Road, Rochester, N.Y., U.S.A.
1902. Weeks, Wm. H., 508, Willoughby Avenue, Brooklyn, N.Y., U.S.A.
1895. *P* Welch, Robert John, M.R.I.A., 49, Lonsdale Street, Belfast.
1923. Wesley, Edward Francis, 2, Arthur St., New Oxford St., London, W.C. 2.
1913. Western, W. H., 108, Greenway Street, Darwen.
1907. Wheat, Silas C., Library of the Brooklyn Museum, Eastern Parkway, Brooklyn, N.Y., U.S.A.
1920. Wheatcroft, S., Railway Street, Chorley, Lancs.
1917. Whitelock, Wm. H., Rosedale, Westbourne Rd., Edgbaston, Birmingham.
1889. Williams, John M., 31, Grove Park, Liverpool.
1915. Wilman, Miss M., McGregor Memorial Museum, Kimberley, South Africa.
1920. *L* Winckworth, Major Harold C., R.A.M.C., 37, Upper Rock Gardens, Brighton.
1913. *L* Winckworth, Ronald, M.A., F.R.G.S., 37, Upper Rock Gardens, Brighton.
1921. Wincott, A. W., "The Glyn," West Cross, Swansea.
1917. *L* Wintle, James Benedict, O.S.B., F.Z.S., 30, Marlborough Road, Gunnersbury, London, W. 4.
1898. Woods, Henry, M.A., F.R.S., F.G.S., Sedgwick Museum, Cambridge.
1886. *L* Woodward, Bernard B., F.L.S., etc., 4, Longfield Rd., Ealing, W. 5.
1914. Worsfold, Herbert W., 168, The Grove, Wandsworth, S.W. 18.
1895. Wright, Charles East, Neale Avenue, Kettering.

Note on *Venus affinis*, Sowerby.—This species was described in the Thesaurus II, p. 720, pl. clv, f. 62, on specimens in the collections of Cuming and Gubba, from Senegal. There is, however, a *Venus affinis* of Gmelin (hodie *Pitaria affinis*), and I therefore re-name Sowerby's species *subrosalina*, the name being chosen to emphasize its resemblance to *rosalina* Rang, which is also a Senegal species. Both belong to the group *Ventricola*, which is generally placed as a section of the genus *Antigona*, but might conveniently be allowed generic rank. *V. subrosalina* is easily distinguished from its congener by its more circular lunule, and the much more massive ribs, as well as by other points. Besides the type set, the Brit. Mus. has an example from Goree which was probably collected by von Maltzan.—J. R. LE B. TOMLIN. (Read before the Society, December 6th, 1922).

THE EDIBLE MOLLUSCS OF THE BRITISH ISLES.

By E. W. SWANTON, A.L.S.

(Presidential Address delivered at the Annual Meeting, 21st October, 1922.)

MAN'S earliest interest in molluscs was doubtless gastronomic; by experiment he learnt to discriminate between esculent and unwholesome kinds. Huge shell-mounds here and there on our coasts afford striking evidence of his appreciation of a shell-fish diet. Vast accumulations of oyster shells in kitchen middens indicate the high esteem in which oysters were held by the Iberians. Cockles, mussels and limpets were also eaten. Large numbers of cockle shells were found by Sir Gardner Wilkinson in the ditches of the British earthwork known as Nottle Tor, in the Gower district of Glamorgan.

Limpet shells have been found in great numbers in cromlechs in the Channel Islands. Jeffreys notes¹ that "the limpet appears to have formed a considerable part of the food of the primitive inhabitants of North Britain, where heaps of their shells are continually being turned up. In the ruins of a so-called Pictish fort near Lerwick the shells are partially calcined, and those of the common periwinkle, which are also found there, must have been subjected to the action of fire in order to extract the animals." The same author records² that shells of *Purpura lapillus* are found in the kitchen middens of 'Picts' houses near Wick, associated with those of periwinkle, and occasionally of limpet and mussel.

A midden, apparently of Romano-British times, containing shells of *Tapes decussatus*, together with oysters and cockles, was found some years ago in the Kingston-by-Sea gravel-pits near Shoreham. Mr. Herbert Toms informs me that he has found shells of *T. decussatus* associated with oyster shells which had been scratched out by rabbits from the chalk of the ramparts at Cissbury. He has failed to find evidence that oysters were eaten generally in Sussex before the advent of the Romans. He thinks that the oyster could not have come into general use as food until means were at hand for systematic dredging. That the Romans valued British oysters so highly as to import them is well known. Juvenal³ refers to the high esteem in which those from Rutupiae (Richborough, in Kent) were held by the epicures of his time. Some of our larger *Helices* were eaten by the Britons and Romans.

¹ Jeffreys, Brit. Conch., vol. iii, p. 238.

² *Op. cit.*, vol. iv, p. 281.

³ Juvenal, Sat. iv., 140.

Many large shells of *Helix aspersa* were found beneath three feet of kitchen midden at Hastings¹ in association with *Littorina littorea*, *Patella vulgata*, *Cardium echinatum*, *Buccinum undatum*, etc. In 1888 Pitt-Rivers, whilst excavating Bokerly Dyke, a Romano-British entrenchment not far from Cranborne, found² 183 oyster shells, three broken mussel shells, 24 shells of *Helix nemoralis* and 109 of *Helix aspersa*.

Shells of *Helix aspersa* with those of *Fusus antiquus*, *Buccinum undatum*, *Cardium echinatum* and *Ostrea edulis* have been found at Wroxeter. Large masses of shells of *Helix pomatia* have been dug up at Lymne in Kent, the Portus Lemanis of the Romans.

Helix arbustorum has been noted in both long and round barrows in Yorkshire, hence it is probable that this species was eaten in very early times.

Quantities of *Helix nemoralis* and *H. hortensis* were found by Pitt-Rivers in excavations at Cissbury, Caburn and Seaford Camps. At Cissbury *H. nemoralis* occurred in association with a human skeleton and a lot of animal bones near the bottom of one of the filled-in Neolithic shafts. In the early British pits and camp on Mount Caburn, near Glynde, *Helix nemoralis* was found in great abundance; in some pits they were associated with oysters, periwinkles and cockles, also bones of domestic animals.

At the pre-Roman camp at Seaford a whelk was found two feet below the surface with a considerable number of *H. nemoralis* and *H. hortensis*.

The question whether *H. nemoralis* and *H. hortensis* were eaten by prehistoric peoples was first discussed, I think, by Mr. Toms in a paper entitled "Rough Notes on Land and Marine Shells associated with Local Archæological Remains," read before the Brighton and Hove Archæological Club in April, 1912. He had noticed large numbers of bleached shells associated with Roman and British pottery on the sites of ancient cultivation balks near Brighton. The Rev. W. A. Shaw tells me that *H. nemoralis* was found in British middens excavated on Stoke clump, West Sussex, in 1910. Mr. J. R. Mortimer and others have noted the occurrence of *H. nemoralis* and *H. hortensis* at ancient camps in other parts of England. Evidence is now rapidly accumulating that these molluscs were eaten during hard times, if not regularly, and from very early times, for Worthington G. Smith found *H. nemoralis* on a "palæolithic floor" at Stoke Newington.

¹ J. W. Taylor, Monograph L. & F. Shells of British Isles, vol. iii., p. 251.

² cf. E. W. Swanton, The Mollusca of Wiltshire, *J. of C.*, vol. xii., p. 177.

In the dialogues of Ælfric (Grammaticus) written in the eleventh century a fisherman reports that he took from the sea "herrings and salmons, porpoises, sturgeons, oysters and crabs, mussels, winkles, cockles, flounders, plaice, lobsters and such like."

Holinshed writing of our "native productions" alludes to our "no small store of great whelkes, scalops and periwinkles, and each of them brought farre into the land from the sea-coast in their several seasons."¹

On some of our coasts shell-fish were, in times of great scarcity, the chief available food. In ²Pennant's day natives of the Western Islands of Scotland were sometimes reduced to subsisting almost entirely on periwinkles and limpets.

The following list has been compiled largely from ³Lovell :—

Mytilus edulis L.—Common mussel. Very highly prized as food. In Lancashire the poor eat cockles, in the midland counties mussels are chiefly eaten, and mussels, whelks and periwinkles in the Metropolis. Mr. J. C. Wilcocks stated in 1884⁴ that the quantity of mussels used for food was so large that for carriage from the estuary of the Exe alone the London and South-Western Railway received £2,000 in one year. Wasteful consumption, reckless destruction of immature mussels and totally inadequate efforts at artificial culture have brought about a mussel famine on some parts of our coasts. The great natural scalps are those of the Wash and Morecambe Bay. Those of the estuary of the Clyde, from which 100,000 tons of mussels are computed to have been taken since 1840, are now exhausted. In the nine years 1913-1921 about 84,557 tons of mussels were landed in England and Wales. Cultivation is chiefly practised in the Thames estuary and the Medway, in the Teign and Exe, and at Montrose, but it fails to supply the demand and large quantities of mussels are imported from Holland. Mussels living in polluted waters may disseminate pathogenic organisms, especially those of typhoid. The consequent restriction of the supply is very serious. The Ministry of Agriculture and Fisheries, and other interested bodies, especially the Lancashire and Western Sea Fisheries Committee and the University of Liverpool,⁵ have carried out at Conway very important investigations of the method of cleansing mussels by chlorine. A first result has been the re-opening of the fishery. Regular work during the mussel season (September 1st to April 30th) at very remunerative rates has

1 Description of England (1577), p. 225.

2 Pennant's Tour in Scotland and Voyage to the Hebrides, 1772.

3 M. S. Lovell, "The Edible Mollusca of Great Britain," 2nd ed., 1884.

4 Fisheries Exhibition Literature, vol. xi., p. 453.

5 "Fisheries in the Great War," p. 91.

been provided for some 40 fishermen. Each week about 16 tons (approx. 20,000 quarts) of cleansed mussels have been marketed.¹

VolSELLA modiolus L.—Horse mussel. Forbes and Hanley² state that these are eaten at Rothesay and are waded for at low tides. "Also eaten in the north of Ireland, but not considered very good on account of their strong scent and flavour, but they are capital bait for cod."³

Pinna fragilis Penn.—Sea-wing. Lovell records that "as an article of food, the *Pinna* is nearly as good as the scallop."⁴

Ostrea edulis L.—Oyster. One of the most valuable products of the ocean. In 1903 the value of the world's production was estimated at £4,000,000 per annum. From Roman times to the present day British oysters have been specially prized. There are many references in the works of antiquaries, e.g., Leland in his Itinerary refers to Whitstable as "a great fisher-towne of one paroche. Ther about they dragge for oysters." It is said that oysters bred on the London clay acquire a more delicate flavour than elsewhere. A "native" oyster was defined by Frank Buckland as a thorough-bred one from the Thames estuary or its vicinity, from Harwich on the north down to Margate on the south. In the 14th century oysters taken at Thorney, in Kent, sold at the uniform rate of halfpenny the hundred, at Sharpness, in Kent, 7d. the bushel. A feast at which the Lord Chief Justice was entertained in 1674 at Lyme Regis included 300 oysters. They cost four shillings. In 1866 it was computed that 498 million oysters were sold in London. Writing in 1895, the Rev. A. H. Cooke gives many details as to prices and notes that our principal beds are those at Whitstable, Rochester, Colchester, Milton (famous for its "melting" natives), Faversham, Queenborough, Burnham, Poole, Carlingford, and Newhaven, near Edinburgh.⁵ In the nine years, 1913 to 1921, no less than 278,889,163 oysters were landed in England and Wales. The average value of a hundred oysters in 1914 was 6s. 7d.; in 1918 it was 10s. In 1921 there was a record number landed, viz. :—39,439, 204. The oysters taken during the war were more numerous, by 13 per cent., than in previous years. Oysters contaminated by sewage can transmit disease, especially the typhoid⁶ bacillus. Reference may here be made to that pest of oyster beds, the so-called crow oyster or slipper limpet, *Crepidula fornicata*. Mr. J. E. Cooper, in 1905,⁷ stated that it was originally introduced with

1 *Op. cit.*, p. 96.

2 British Mollusca, ii., 185.

3 Lovell, Edible British Mollusca, p. 69.

4 *Op. cit.*, p. 88.

5 Cambridge Natural History, Molluscs and Brachiopods, p. 105.

6 Fisheries in the Great War, pp. 103 and 104.

7 *J. of C.*, vol. xi., p. 227.

American oysters, and had been found in several of the Essex rivers for eleven years or more. In 1909 he found it near Sandwich.¹ In the following year Mr. Gyngell recorded its occurrence at Cleethorpes on the Lincolnshire coast,² and Mr. F. H. Sikes found it in the Medway in 1910.³ Since then it has invaded the oyster beds of the Thames and adjacent estuaries, and multiplied to such an extent as to cause many of the beds to become almost derelict. Soon after the outbreak of war the Ministry of Agriculture and Fisheries set to work to clear the oyster beds in the Estuary of the Blackwater of this pest, and at the same time to convert it into a commercial product. First of all the shells were crushed and sold as manure to local Essex farmers, 1215 tons being sold in two seasons. Later, experiments were made in separating the meat from the shell and producing a shell-grit for the use of poultry. These were very successful and the Ministry is turning out annually from a small factory established at West Mersea about 800 tons of grit. During the war 5,648 tons of limpets were removed from the oyster grounds and utilised. More recently it has been discovered that the limpets themselves can be converted into a useful poultry meal.

Pecten maximus L.—Escallop or Scallop. Jeffreys remarks⁴ of this species "If the oyster is the king of mollusks, this has a just claim to the rank and title of prince. In Lister's time they were held in nearly the same esteem, and the great scallop is even preferred by some." He was told that an epicurean officer of the coast-guard had exterminated the breed in Lulworth Bay! The London markets are supplied chiefly from the south coasts, but the yield is inconsiderable, for in the nine years 1913 to 1920 the total quantity of this species, together with *P. opercularis*, landed in England and Wales was only 926 tons.

Pecten opercularis L.—Queen, Squinn or Frill. Is almost equally esteemed as the preceding. In the eighties Weymouth trawlers obtained on an average five bushels per week. About the middle of the last century they were sold at 2d. per hundred, and 700 to the bushel.

Isocardia humana L.—Oxhorn cockle. Though widely distributed it is abundant only in a few localities. Highly prized by Brixham fishermen, by whom they are called "Torbay-noses."

¹ *J. of C.*, vol. xii., p. 315.

² *J. of C.*, vol. xiii., p. 14.

³ *J. of C.* vol. xiii., p. 108.

⁴ *British Conchology*, vol. ii., p. 74.

Macra stultorum L.—Trough shell. Jeffreys¹ was informed by Mr. Dennis in 1862 that at Newhaven harbour “some of the people eat this *Macra*.”

Spisula solida L.—Occasionally eaten in Devon and elsewhere.

Meretrix chione L.—This species is included in Lovell's list, “though it is not sufficiently abundant to form any more than a rare and dainty dish with us.” The fishermen at Hayle call them “cocks,” and told Lovell they usually cooked them by boiling, but did not often eat them.²

Ventricola verrucosa L.—Occasionally eaten in the Channel Islands, e.g., in the islet of Herm it is collected for eating from the small pools between the rocks at low water;³ and is eaten “habitually in county Clare.”⁴ Mr. Damon, of Weymouth, on visiting Henmare [? Kenmare] found that owing to the great consumption of *Venus verrucosa* for food, the species was nearly exhausted.

Tapes aureus Gmelin.—Brought to market at Falmouth under the name of “hens.”

Tapes virgineus L.—Occasionally eaten.

Tapes pullastra Mont.—Pullet. Frequently eaten in Devon, Hants and Sussex. On our northern coasts it is chiefly used as bait. Jeffreys tasted one raw and fancied that its flavour was not inferior to that of an oyster.⁵

Tapes decussatus L.—Hen cockle. Frequently eaten in Devon, Hants and Sussex, and sold as “butterfish” in Hants and Sussex. Lovell records that “At Stubbington, near Titchfield, quantities are collected and sold in the neighbourhood at 5d per quart. Butterfish are considered very wholesome, and I was assured by the cockle gatherers that they may be eaten with impunity at all times of the year. At Falmouth they are considered far richer and sweeter than cockles, and are sold in the market at 3d. per hundred.”⁶ Mr. Toms informs me that it is eaten at Shoreham and Southwick, and Mr. R. Winckworth notes that it is gathered for food at Aldrington, Sussex.⁷

Cardium aculeatum L.—Spring cockle. Not uncommon on the coast of S. Devon. It is an esteemed esculent at Paignton and Dawlish.

Cardium echinatum L.—Prickly cockle. Occasionally eaten.

¹ *Op. cit.*, vol. ii. p. 424.

² *Op. cit.*, p. 32.

³ Forbes and Hanley, *British Mollusca*, vol. i., p. 404.

⁴ Jeffreys, *op. cit.*, vol. ii., p. 341.

⁵ *Op. cit.*, vol. ii., p. 358.

⁶ *Op. cit.*, pp. 26, 27.

⁷ *J. of C.*, vol. xvi., p. 91.

Cardium tuberculatum L.—Red-nosed cockle. A local species. Frequent about Paignton and Dawlish where it is eaten by the cottagers.

Cardium edule L.—Common cockle. Equally good either raw or cooked. Raking cockles provides a means of livelihood for many poor people. Through failure of the potato crop the inhabitants of the Orkneys have sometimes subsisted chiefly on cockles. In 1879 the cockles gathered in Morecambe Bay realised £20,000. The cockle fishery in Caermarthen Bay gave employment in the eighties to 500 or 600 families, and the cockles collected annually were computed to be worth at least £15,000. From 1913 to 1921 about 80,685 tons of cockles were landed in England and Wales. T. Vener, a 17th century writer, did not hold cockles and mussels in high esteem, and thus expresses himself concerning them, "Amongst shell-fish muscles are of grossest juice and worst nourishment, and most noisome to the stomach. They abundantly breed flegm and gross humours, and dispose the body unto fevers. I advise all such as are respectful of their health utterly to abandon the use of them. Cockles are not so noisome as muscles, they are of lighter concoction and better nourishment, yet not laudable meat for such as lead studious or easy kind of life, or have weak stomach."¹

Mya arenaria L.—Sand gaper. Jeffreys observes² that it is eaten and relished by man and fish in Europe, Asia and America. At Southampton the fishermen used to call it "old maid" according to Montagu, and at Belfast it has the equally strange name of "cockle-brillion." Lovell notes that it is eaten by the poorer classes at Chichester Harbour and Fareham under the name of "pullers," and that it is called "sugar-loons" at Youghal, and "colliers" at Dublin. "At both places they are considered good bait, and fit to eat, but at Youghal they warn you to be careful to take off the skin which covers the outside of the shell and tube, as it is supposed to be poisonous."³

Mya truncata L.—Eaten in Orkney under the name of Kunyu.

Ensis ensis L.—Occasionally collected for food.

Ensis siliqua L.—Razor-shell. Very delicious when boiled, and eaten in many parts of the British coast. Sometimes used for fish sauce, having a shrimp-like flavour, and occasionally fried or stewed. It is collected either by putting salt on the hole or by using a long narrow wire, bent and sharpened at one end.

Solen vagina L.—Sometimes eaten, but has a peculiar and acrid flavour.

¹ Via Recta ad Vitam Longam, 1650.

² *Op. cit.*, vol. iii., p. 65.

³ *Op. cit.*, p. 9.

Pholas dactylus L.—Piddock or clam. Known as “long oyster” at Weymouth. It is sometimes collected for eating from the chalk boulders between Newhaven and Brighton, but more frequently used for bait. In the Channel Islands it is sold in the market boiled ready for eating.

Zirphæa crispata L.—Captain Bedford informed Jeffreys that it is eaten by the poor at Oban.

Patella vulgata L.—Limpet. “Roasted limpets are capital eating,” declared Jeffreys after partaking of some with bread and butter in the islet of Herm, but it is generally conceded that they are much too leathery. In some districts enormous quantities are consumed. Mr. Patterson, in a paper contributed to the *Annals of Natural History* in June, 1839, stated that at Larne, in Antrim, more than eleven tons of boiled limpets were sold in a single season of four months, and that thirty people earned £100 in collecting them. In 1884 limpets ready boiled were sold regularly in the fishmarket at Truro at 1s. a quart. In the Isle of Man they are gathered in great numbers and are called “flitters.”

Haliotis tuberculata L.—Ormer or earshell. Highly praised by old authors. It has been described as “a lump of white pulp, very sweet and luscious” and “infinitely more pleasant to the gusto” than a good oyster, “so that an epicure would think his palate in paradise if he might but always gourmandize on such delicious ambrosia.” It is abundant on the coasts of the Channel Islands.

Gibbula cineraria L.—On some parts of our coasts it is known as the Dog Periwinkle. Mr. A. Morton informed Lovell¹ that occasionally a few pints of *Trochus* appear in the markets at Jersey and are sold as winkles.

Monodonta crassa Mft.—Lovell recommends this species “simply boiled and eaten as periwinkles, the flavour resembling the latter, and being quite as sweet and palatable.”¹

Littorina littorea L.—Winkle. The old English name of “periwinkle” is supposed to have been a corruption of petty winkle or wilk. This mollusc is largely consumed by the poor. In 1858 it was estimated that the annual consumption in London amounted to 76,000 baskets, weighing 1,900 tons, and valued at £15,000. In 1865 one thousand bushels a week were sent every spring and autumn to London from Kirkwall and Stromness; at that time 2,000 bushels of winkles were received weekly at Billingsgate from March to August, and 500 bushels weekly for the rest of the year. At least

¹ *Op. cit.*, p. 189.

1,000 persons found employment in collecting, and quite as many more in selling them. The trade price at that time varied from two to eight shillings per bushel of eight gallons, heaped measure. In the nine years 1913 to 1921 some 5,816 tons of periwinkles were landed in England and Wales.

Buccinum undatum L.—Common whelk. Whelks are in season in August and September, though they can be eaten at any time. They are consumed in enormous numbers by the poorer classes, being considered nutritious and said to be always free from poisonous matter. According to evidence given before a Select Committee of the House of Commons in 1866, the whelk fishery on the sandy flat in Whitstable Bay yielded £12,000 per annum. Part went to London to be disposed of as food, and part to the cod smacks as bait. In 1883 Mr. Harding reported¹ that the Lynn fishery alone supplied 1,250 tons of whelks annually, and that most of them went to London. The average cost for collecting was about £10,000. The Great Grimsby fishery at that time supplied about 150,000 wash of whelks annually (a wash contains 21 quarts and a pint) and the average price for the season was about 3s. a wash, a total value of £22,500. During the nine years 1913 to 1921 about 19,755 tons of whelks were landed in England and Wales.

Neptunea antiqua L.—Red whelk. Lovell¹ notes that this species is eaten in Liverpool, and that great quantities are taken on the Cheshire coast.

Purpura lapillus L.—In March, 1868, this species was sold at Hastings ready boiled for eating at 1d. per pint, under the queer name of Mansuckers.² It is said to taste like periwinkle.

Sepia officinalis L.—Cuttle fish. This species is frequently eaten by our fisher folk. It is sometimes hawked in baskets and recommended as wholesome food. The flavour is said to bear a considerable resemblance to that of tripe.³

Agriolimax agrestis L.—Dew slug. Until recent years it was eaten, on the recommendation of the medical faculty, by persons suffering from consumption. Taylor records⁴ that one of his relatives who was thought in his youth to show consumptive tendencies made this slug a regular article of diet for some time. *Arion ater*, *Limax maximus* and *Limax flavus* also at one time appeared in the *Materia Medica*.

¹ Fisheries Exhibition Literature, vol. iii., p. 303.

² *Op. cit.*, p. 207.

³ Couch, Cornish Fauna, p. 82. The German for tripe is kuttel.

⁴ Monograph, vol. i., p. 428.

Helix arbustorum L.—Shrub snail. Taylor observes that this mollusc formerly occupied a place in the *Materia Medica*, and “is still used as food in some parts.”¹

Helix aspersa Müll.—Common garden snail. Sold in the Bristol markets and elsewhere under the name of “wall-fish” and is an esteemed article of diet by the poor of Bristol, Swindon and other towns. There are men who make their livelihood during winter by collecting these snails.² Mr. Douglas Bacchus informs me that the Bristol “wall-fish” merchants call when hawking them for sale, “Wall-fish! Wall-fish! Kidney-bean climbers.” In the early part of last century the glass men at Newcastle once a year held a snail feast.³

Helix pomatia L.—Apple snail. Greatly esteemed in France, but only occasionally eaten in England. I have partaken of it in Kent, but do not agree with the late Kenneth McKean’s description of it as “really excellent food.” It is collected in some parts of Kent for the London markets. A restaurateur in Soho estimated that 100,000 are consumed in London every year from October to Easter and the fashion is spreading to the provinces.⁴ It was formerly eaten by persons suffering from pulmonary disorders.

Helix nemoralis L.—Wood snail. Formerly eaten in Britain, and still esteemed in many parts of Europe. It occupied at one time a place in our *Materia Medica*.

Helix hortensis Müll.—Striped hedge snail. Esteemed as an esculent in many parts of France, and formerly eaten in Britain. At one time included in our *Materia Medica*.

Anodonta cygnea L.—Swan mussel. Lovell⁵ notes that it is said to be eaten by the peasantry in Leitrim.

The modern statistics given in the above notes are from information supplied from the Fisheries Department of the Ministry of Agriculture and Fisheries. The attention of conchologists may be specially directed to the Ministry’s Report on Sea Fisheries for the years 1915, 1916, 1917 and 1918, entitled “Fisheries of the Great War.”

1 Monograph, vol. iii., p. 422.

2 Swanton, *Mollusca of Somerset*, p. 25.

3 Gray’s ed. of Turton’s *Manual*, p. 130.

4 J. W. Taylor, *op. cit.*, vol. iii., p. 220.

5 *Op. cit.*, p. 74.



MOLLUSCA FROM THE BELGIAN CONGO (II).

By G. C. SPENCE.

(Read before the Society, December 6th, 1922).

PLATE I.

DURING the course of the year 1921 Mr. F. M. Dyke paid a further visit¹ to the Belgian Congo and again collected a quantity of molluscs, which he kindly sent to me for investigation.

As before, collections were made at Leverville, Boteke, Elizabetha, Alberta, near Bumba, Barumbu and the following additional localities:—Ekongu West, near Alberta; Bulungu, Dist. de Kwango, 4°40' S., 18°40' E.; Stanleyville, 0°30' N., 25°15' E.

Barumbu is situated in a country of small hills and ravines about 500 metres above sea level, the typical growth being oil palms, forming secondary forest after the destruction of the primeval forest of mahogany, copal, cotton, &c. Temperature averages around 85° Fah., without any marked dry or rainy season.

Bulungu, also, is in a district of small hills (not exceeding about 150 metres above river level) and valleys with heavy original forest immediately surrounding the settlement; beyond this is mile after mile of almost pure palm forest. The Kwango district generally is 400/500 metres above sea level. The climate is not very variable—dry season June to mid-July. Rainfall some 70 inches per annum; heaviest October-November, with a minor rainy season in March and April.

So far as Mr. Dyke has seen, the geological conditions of most of the inland Congo territory is much the same—a sandy-clay to clayey-sand containing much iron and, at times, large masses of laterite. Not a trace of lime except in one or two special districts, especially near the coast. The ordinary river water only contains 4-5 grains of solids per gallon and is almost like distilled water, except for the brown colour of organic matter from the marshlands.

In all, some 39 species (of which six are described as new) are represented in the collection, but a number of these, being unidentifiable on account of condition or already recorded in my previous paper, are not included below. The specimens are mostly in splendid condition; a number, preserved in alcohol, contain the animal and have been submitted to Mr. Hugh Watson, of Cambridge, who has kindly undertaken to examine them. Anatomical knowledge of some of these, e.g. *Ceras*, is badly wanted. Unfortunately Mr. Watson has not yet been able to complete his investigations, the results of which

¹ See *J. of C.* vol. 16, page 265.

will appear later, when it may be found necessary to modify the generic position of some of the species hereafter mentioned.

LEVERVILLE.

Achatina schweinfurthi Martens, var. **semifusca** nov.—Similar to the type form but rather more solid, smoother; mouth narrower, brown flames not so zig-zag, whilst the whole of the base from the periphery is almost uniform rich chestnut. Length 146, diam. max. 74 mm. Aperture 80×37 mm. In dense undergrowth under oil palms.

The brown colouration of the base in this handsome form is also persistent in juvenile shells. It may later be thought worthy of specific rank, but until further examples are obtained it seems advisable to consider it a variety.

Pseudoglessula (Kempioconcha) stuhlmanni (Mts.). Under dead wood in forest.

P. (Ischnoglessula) pulchella, n.sp.—Shell imperforate, subulate, dark olive with narrow blackish brown streaks across the whorls at intervals; shining. Similar to *P. subfuscidula* Pils., but smaller, the vertical ribbing on the embryonic whorls not so pronounced or so widely spaced. The oblique ribs on the whole of the remaining whorls are weak and low, though distinct. The keel defining the base is stronger whilst the columella is more curved and not so abruptly truncate. Whorls 9, length 9 mm., diam. max. 2.75 mm. Length of aperture 2 mm. Under dead wood in forest.

The single specimen obtained contained a long ovate egg (1.5×1 mm.) with white glossy granulate surface.

Pseudopeas plebium (Morelet).—Under dead leaves at roots of forest trees.

Curvella ovata (Putzeys).—Under dead wood under oil palms.

Ptychotrema (Parennea) dykeiana, n.sp.—Shell rimate, cylindric, upper third bluntly conic, buff coloured, somewhat lustrous. Apex rounded, first two whorls smooth, remaining six with ribs which are recurved below, narrow and about half the width of the intervening spaces; on the face of the whorl immediately over the aperture there are four in the space of one millimetre. The last whorl tapers below and has a wide shallow median furrow running from the left side round the back to the peristome. Suture impressed and strongly crenulate. Aperture somewhat triangular. Angular lamella long, curved and tapering as it penetrates inwards and joined to the recurved outer lip by a raised, curved, slightly thickened and glossy callus. Columella straight above, concave below. There is a blunt

slightly bifid tooth within the outer lip continued inward in a long acute palatal fold penetrating to the ventral face ; bifid at the tip and visible through the semi-transparent shell. Peristome broadly expanded and reflexed. Length 7.5 mm., diam. max. 3.75 mm. Amongst dead leaves at roots of forest trees. I have pleasure in naming this beautiful little shell after its discoverer.

Ledoulxia mesogæa (Mts.).—On tree stump.

Pleuroprocta silvatica, Pils.—Under dead wood beneath oil palms.

Cyclophorus (Maizania) intermedius, Mts.—In palm forests. BOTEKE.

Ceras manyemaense Dupuis and Putzeys.—Under dead wood in forest. This record extends the known range of *Ceras* very considerably, being some 250 miles west of Elizabetha, and roughly 450 north-west of Nsendwe and Vieux Kassongo, which are the three previously recorded localities.

Pseudopeas scalariforme, Putzeys.—On dead wood in forest. Previously only known from Nsendwe.

Ledoulxia mesogæa (Mts.).—On shrubs and dead plantain leaves.

Trochozonites bellula (Mts.)

T. (Zonitotrochus) aillyi, Pils.

T. (Teleozonites) adansonæ (Mor.)

} Under dead leaves in forest.

Helicarion (Zonitarion) haliotides, Putz. (*Mesafricarion haliotides* (Putzeys) Pilsbry in review of L. M. of the Belgian Congo, 1919). Under dead leaves and bark in forest.

Pleuroprocta silvatica, Pils.—A dark example under dead wood in forest.

ELIZABETHA.

Ceras texistriatum, n. sp. (*Ceras manyemaense*, D. and P., Spence in *J. of C.* vol. 16, page 267).—Shell elongated, nearly straightly conic, glossy on the first six whorls, then becoming almost dull on the remainder. Thin but strong, white, covered with a thin pale brown epidermis having numerous irregular dark chestnut stripes transversely from suture to suture. Apex as typical of the genus. Whorls 13, almost flat, with slightly impressed suture ; strongly decussate below, becoming weaker above and almost imperceptible on the earliest whorls. Last whorl carinate, base convex. Radially marked with growth lines and having slight concentric lines (almost confined to the inner edge of the keel) forming a weak decussation. Columella strongly curved, twisted and abruptly truncate.

Outer lip thin, nearly straight; at right angles to the curved basal lip and having a gutter at the junction of the two formed by the projecting keel. Length 35, diam. max. 7 mm. In grass by native path, Elizabetha.

This shell was doubtfully recorded as *C. manyemaense* in my previous paper. In the meantime, however, it has been submitted to Major Dupuis, who kindly compared it with the type material, and expresses the opinion that it is new. The shell is duller and far more strongly sculptured than the two previously described species. *C. dautzenbergi* is much more slender and the whorls do not increase so rapidly, whilst *manyemaense* increases in width more rapidly and has only 12 whorls as against 13 in the same length.

Atoxon (?) faradjensis Pils.—On palm trunk. One full grown example of a creamy yellow, maculate with gray on the mantle and black on the tail.

The species of *Atoxon* are extremely difficult to identify and whilst the present specimen externally resembles *faradjensis*, Mr. Watson writes me that the more characteristic portions of the reproductive system seem closely to resemble *Atoxon flavum rutshuruense* (as figured by Pilsbry in his paper on Congo Mollusks), but it is quite possible that Pilsbry's figure of the immature genitalia of *faradjensis* would develop into the same type as *flavum*. Mr. Watson further points out that Pilsbry figures both species as having a short lobe above the caudal mucous pore. This lobe does not appear in the present example, but Simroth does not show this in *A. flavum*, so that perhaps it is a variable feature.

ALBERTA.

Burtoa nilotica (Pfr.) var. **obliqua** (Mts.). A large, solid and heavy form "under dead leaves, &c., on marshy ground in forest."

Achatina schweinfurthi, Mts., subsp. **rhodacme**, Pils.

BUMBA.

Homorus (Subulona) bumbaensis, n. sp.—Shell small, subulate, attenuate above, white, covered with an olive epidermis having irregular darker streaks. Glossy with, except as aftermentioned, weak growth wrinkles. Embryonic whorls three, first smooth, mammillate; second and third cylindric and smooth except for strong, short regular folds below the suture. Remaining six whorls convex with well-impressed suture above which, on the last half whorl, is a narrow white streak. Body whorl attenuate below and obsoletely angled. Aperture oblique, pyriform, columella regularly and strongly curved with a thickened emerging lamina forming the edge of the lower half. Abruptly truncate below. The junction of the columella with the

lamina marked by a long impressed curved suture. Length 9, diam. max. 2.25 mm. Length of aperture 1.75 mm.

This plain little species is the smallest *Subulona* yet recorded from the Belgian Congo.

Pleuroprocta silvatica Pils.—Two juveniles.

BARUMBU.

Cyclophorus (Maizania) intermedius, Mts.—On sandy forest path.

EKONGU WEST.

Perideriopsis fallsensis D. and P.—Two specimens, one of which contained 13 or 14—mostly broken—pale yellow eggs, having a thick calcareous shell, smooth and dull. Size 5.5×3.75 mm.

BULUNGU.

Trochozonites bellula (Mts.).—One under dead wood in forest.

Achatina rugosa, Putz.—On sandy path near Mpala Village (inland from Bulungu; $4^{\circ}45'$ S. ; $18^{\circ}35'$ E.).

One example which, except for its darker and better defined narrow flames, is identical with typical *rugosa*, of which four of the original lot collected by Major Dupuis from Manyema are before me. These are so different from a specimen of *A. iostoma*, Pfr. from the Cameroons (kindly sent me in another connection by M. Dautzenberg) into the synonymy of which *rugosa* has been sunk by Dautzenberg and Germain, that I have used Putzeys' name to indicate the special form under notice.

STANLEYVILLE.

Numerous juvenile **Ampullaria** of two species, probably **wernei**, Phil. and **leopoldvillensis** Putzeys from ponds in the vicinity of Stanleyville. Much prized by the natives for food and often eaten by Europeans. There are also a small number of *Thapsia* from Boteke and Leverville, but in the absence of authentic material for comparison it is impossible definitely to identify them with any known species, whilst to describe as new would only make confusion worse confounded in this particularly difficult group. I shall be happy to lend the specimens to anyone who undertakes the study of these forms.

Mr. Dyke was also at Ngandu on the French side of the river about ten miles from Kwamouth (roughly $3^{\circ}15'$ S. ; $16^{\circ}15'$ E.) and collected the undermentioned species amongst "beach wash." The shells, however, may have been water carried for many miles. The Kasai joins the Congo at Kwamouth and there is an extremely strong current.

Melania liebrechtsi, Dautz.

Mutelina carrei, Ptz. (Juvenile).

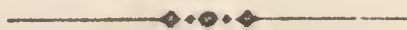
Cleopatra dupuisi, n. sp.—Shell imperforate, elongate, turreted, white under an olive epidermis, apex eroded and decollate. Whorls remaining four or five, parted by an impressed undulating suture; flat and cylindric with sharply angled shoulder. Girdled with five keels, the three centre ones filiform on the earlier whorls but nearly effaced later by strong, irregular, curved growth lines. First and fifth nodulose, the nodules developing into short, blunt spaced spines which develop more rapidly on the first than the fifth. An occasional weak nodule is perceptible on the centre keels also. Base slightly convex and carrying seven or eight raised concentric lines. Aperture pyriform. Interior whitish. Operculum unknown. Length (type) 14, diam. max. 5 mm. Five whorls remaining.

This species is evidently related to *C. bequaerti* Dautz. and Germ., but, in addition to other differences, is larger and more elongated, while the lines on the base are finer and more numerous. It is with pleasure that I associate this shell with Major Paul Dupuis, who has contributed greatly to our knowledge of the Mollusca of the Congo.

It remains to express my grateful thanks to Messrs. Connolly, Dautzenberg, Dupuis, Pilsbry, and others, who have assisted me in many ways, and also to Mr. J. Wilfrid Jackson for photographing the types for illustration.

EXPLANATION OF PLATE I.

- Fig. 1. *Ceras dautzenbergi*, D. & P. Nsendwe. Cotype, $\times 1\frac{1}{2}$.
 „ 2. *C. manyemaense*, D. & P. Boteke, $\times 1\frac{1}{2}$.
 „ 3. *C. texistriatum*, n. sp. Elizabetha, $\times 1\frac{1}{2}$.
 „ 4. *Achatina schweinfurthi*, Mts.; var. *semifusca*, nov., $\times 1\frac{1}{2}$.
 „ 5. *Pseudoglessula* (*Ischnoglessula*) *pulchella*, n. sp., $\times 1\frac{3}{4}$.
 „ 6. *Ptychotrema* (*Parennea*) *dykeiana*, n. sp., $\times 1\frac{1}{2}$.
 „ 7. *Homorus* (*Subulona*) *bumbaensis*, n. sp., $\times 1\frac{3}{4}$.
 „ 8. *Cleopatra dupuisi*, n. sp., $\times 1\frac{1}{2}$.



Clausilia bidentata (Ström), m. *dextrorsum*, in Lake Lancashire.—Among a series of *Cl. bidentata* (Ström) collected from one of the walls of the Cemetery, Grange-over-Sands, Lancs., on April 15th, 1921, was a single dextrally-coiled specimen. The shell is perfectly normal as regards size; the altitude is 10.5 mm., and the major diameter 2.7 mm., the ratio major diameter/altitude having the value 0.257; these figures show the shell to be slightly shorter and more tumid than the average for the series among which it occurred: the means for a series of 200 are:—altitude, 11.23 mm.; major diameter, 2.66 mm.; ratio major diameter/altitude, 0.237. The long axis, which is quite straight in normal specimens, appears to bend round slightly from the apex towards the aperture, and the earlier whorls seem to have grown outwards rather more rapidly than is usually the case, giving the upper portion of the shell a somewhat abnormal, inflated appearance.—W. E. ALKINS. (*Read before the Society, January 4th, 1922*).

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

512th Meeting, held at the Manchester Museum, September 2nd, 1922.
Mr. R. Standen in the chair.

Donations to the Library announced and thanks voted :—

“The Land and Freshwater Mollusca of Perthshire,” by Henry Coates (*from the author*).

“Eocene Mollusca from Nigeria,” by R. Bullen Newton (*from the author*).

“Lamarck’s Genera of Shells,” by J. G. Children (Stutchbury’s own copy ; presented by Col. E. C. Freeman).

Resignations.

Clement Fielding.

Julius Heller.

Papers Read.

“On *Patella depressa* Pennant,” by J. R. le B. Tomlin.

“On *Sunetta hians* (Reeve),” by J. R. le B. Tomlin.

“*Limnæa stagnalis* in Midlothian,” by James Ritchie.

“*Cochlicopa lubrica* monst. *sinistrorsum* West.,” by J. W. Taylor.

The Yorkshire Philosophical Society’s Centenary.

It was reported that notice had been received that the Yorkshire Philosophical Society would hold its Centenary Celebration on September 20th, and it was resolved that a congratulatory letter, signed by the President and the Secretary, be sent in the name of the Society.

513th (Annual) Meeting, held at the Medical School, University College, London, W.C., October 21st, 1922.

In the absence of the President, Dr. A. E. Boycott was elected to the chair.

Amongst those present were the following :—Messrs. J. Wilfrid Jackson, J. C. Dacie, A. S. Kennard, Lionel E. Adams, C. Oldham, Arthur Wrigley, A. J. Saban, J. E. Cooper, R. Bullen Newton, F. B. Jennings, H. C. Fulton, A. Gardiner, R. Winckworth, W. J. Wintle, A. E. Salisbury, W. C. W. Vincent, A. Harman, T. E. Belcher, J. H. D. Saunders, Miss J. D. Robertson, Mr. and Mrs. H. Overton, Major Connolly, Capt. C. Diver, Lt.-Col. A. J. Peile, Drs. C. Price-Jones and E. W. Bowell.

Appointment of Auditors.

Messrs. C. H. Moore and A. K. Lawson were re-appointed Auditors.

Appointment of Scrutineers.

Messrs. H. Overton and R. Winckworth were appointed Scrutineers.

Candidate Proposed for Membership.

Guy C. Robson, M.A., F.Z.S., British Museum (Nat. Hist.), Cromwell Road, London, S.W. 7 (introduced by A. E. Boycott and J. W. Jackson).

Resignation.

Hubert Elgar.

Members Deceased.

Norman Sier.

G. H. Murdoch.

Presidential Address.

In the absence of Mr. E. W. Swanton the Presidential Address, “The Edible Molluscs of the British Isles,” was read by the Chairman.

A cordial vote of thanks was passed to the retiring President for his address.

Votes of thanks were also accorded to the authorities of the University College Medical School (per Dr. Boycott) for permission to hold the Annual Meeting in their rooms ; and to the authorities of the Manchester Museum for continued permission to hold the monthly meetings on their premises.

Election of Officers and Council.

The Scrutineers reported that the Officers and Council for 1922-23 as nominated by the Council had been unanimously elected (*see page 1*).

Exhibits.

By Mr. J. E. Cooper :—*Helix virgata* and *H. gigaxii*, from near Yiewsley, Middlesex ; egg-capsules of some British Mollusca ; species of *Xenophora*.

By Mr. J. C. Dacie :—*Littorina rudis* from many localities.

By Dr. A. E. Boycott :—*Vitrina major*, new to Britain, from Brecon and Bucks ; *H. aspersa* (10005) from Branscombe, S. Devon ; abnormal *Limnæa pereger*, bred in captivity.

By Dr. E. W. Bowell :—Radula of *Vitrina major*, from Burnham Beeches ; radulæ of *Limnæa pereger*, from Enfield (coll. H. E. Biggs), showing variation in teeth ; radula of *L. pereger* (small specimen bred by Dr. Boycott), showing type approximating to that of the *involuta* group ; and other radulæ.

By Mr. A. E. Salisbury :—Marine shells collected at Herm and Guernsey, Sept.-Oct., 1922, including *Galeomma turtoni*, *Pleurobranchus plumula*, *Callochiton lævis*, *Lima hians*, *Tellina crassa*, and *Gari depressa*.

By Mr. J. Wilfrid Jackson :—Series of Non-Marine Mollusca, from Calcareous Tufa, Caerwys, Flintshire.

By Mr. J. Davy Dean :—Interesting species of European *Clausilia* ; also original drawings of the new species of *Alopi*a recently figured in the *Journal*.

By Mr. Alan Gardiner :—*Neolepton obliquatum*, Monts., Lord Brandon Cruise, 1886 ; large *Anodonta cygnea*, from Englefield Lake, Berks. ; and a method of mounting small shells in cork and glass cells.

By Major Connolly :—*Limicolaria* sp. (alive) from British East Africa.

By Lt.-Col. A. J. Peile :—*Oreohelix* (alive) from Utah ; *Leptaxis vulcanica* from Madeira ; series of *Ptychotrema* and *Gulella* from Uganda ; series of *Pæcilozonites*, recent and fossil, from Bermuda, including a fine series of *P. nelsoni*, collected by Arthur Haycock, Esq., for presentation to the British Museum.

By Mr. H. Overton :—Non-Marine shells collected recently at Guernsey.

ANNUAL REPORT.

THE present is the Forty-Sixth Annual Report of the Society. At the last annual meeting the membership stood at 277. Since that time the Society has lost four members by resignation and eight by death. Eight new members only have been elected, so that the membership shows a decrease, being now 273 (including ten honorary members).

The members lost by death are the Rev. Canon J. W. Horsley, a former President of the Society and a contributor to the *Journal* (obituary in this *Journal*, Jan., 1922) ; T. S. Hillman ; J. S. Gladstone ; R. M. Lightfoot ; Rev. E. A. Woodruffe-Peacock (obituary in "The Naturalist," April, 1922, and "Journal of Botany," June, 1922) ; G. H. Taylor ; Norman Sier ; and G. H. Murdoch. Mention should also be made of the death of a former member, J. Kidson Taylor

(obituary in "Lancs. and Chesh. Naturalist," Aug.-Sept., 1922). Mr. Taylor was keenly interested in the British Mollusca as well as in *Cypræa*, *Oliva*, *Harpa*, *Marginella*, *Amphidromus* and *Cochlostyla*. He named and described several varieties of *Cypræa* in our *Journal*. Mr. Taylor bequeathed to the Society his cabinet containing an almost complete collection of British Non-Marine Mollusca, with many locality sets, the whole most beautifully mounted in glass-topped boxes with neatly written labels.

The usual monthly meetings have been held at the Manchester Museum and the attendance has been fairly good. About twenty notes and papers have been read. Some of these have appeared already in the *Journal*, and it is hoped that the others will be published shortly. The Special Exhibits held during the year are:—*Xenophora*; *Pupinella*; British *Clausilia*; British *Vertigo*; and British *Pupilla*. There have been numerous smaller exhibits, the chief of which are mentioned in the monthly Proceedings.

Up to the time of this meeting two numbers of the *Journal* have been published; vol. 16, No. 8, Jan., 1922; and No. 9, June, 1922, comprising 64 pages of text, one plate, and three text-figures. Owing to trouble in the printing trade No. 10 of this volume has been delayed, but its appearance is expected any day. This will complete the volume, making ten parts, as in vol. 15, in place of the usual twelve. It is hoped that vol. 17, which commences in January, 1923, will comprise twelve parts, as before the war, but this will depend upon the state of the Society's finances.

The Library has been well used and has received several important additions, including three books from Messrs. Henry Coates and R. Bullen Newton and Col. E. C. Freeman, already noted in the September Proceedings. The other donors are Drs. H. A. Pilsbry, P. Bartsch, Messrs. A. S. Kennard, B. B. Woodward, G. K. Gude, Bryant Walker, H. Watson, W. E. Alkins, Jas. A. Grieg, H. Beeston, P. Hesse, J. W. Jackson, W. B. Marshall, S. S. Berry, and Rev. L. W. Grensted.

The donations to the Cabinet, in addition to the J. Kidson Taylor bequest mentioned above, consist of a handsome gift by J. F. Musham of a small but choice series of *Cochlostyla*, *Obba*, *Hemiplecta* and *Camæna*; a collection of shell-necklaces from Iona; an interesting series of Non-Marine Shells from Iona, Colonsay, Islay, and Jura; locality sets of *H. nemoralis*, *H. hortensis*, and *H. arbustorum*, from the river bank at Barlby, near Selby, Yorks.

RECORDER'S REPORT.

DURING the past year the following 173 new records have been added to the Census:—

Scilly Isles (1 a):—*Pisidium personatum*, *P. milium* (J. R. Tomlin).

Devon S. (3):—*Vertigo minutissima* (Branscombe, A. E. Boycott), *Pisidium personatum* (J. R. Tomlin).

Somerset S. (5):—*Limax cinereoniger* (E. J. Salisbury).

Somerset N. (6):—*Clausilia rolfhii* (Long Ashton, R. Winckworth), *Vertigo antivertigo* (E. W. Swanton), *Pisidium pulchellum* (J. R. Tomlin).

Wilts N. (7):—*Testacella maugei* (C. D. Heginbotham).

Wilts S. (8):—*Milax gagates* (C. P. Hurst).

Dorset (9):—*Acme lineata* (E. R. Sykes).

Hants S. (11):—*Vallonia pulchella* seg., *Valvata macrostoma* (Christchurch, 1885, C. Ashford).

Hants N. (12):—*Helicella caperata* seg. (W. D. Roebuck).

Sussex E. (14):—*Paludestrina ventrosa*, *Punctum pygmaeum* (R. Winckworth), *Vertigo edentula* (A. E. Boycott).

Kent W. (16):—*Limax arborum* (A. E. Boycott), *Pisidium personatum* (J. R. Tomlin).

Essex N. (19):—*Acanthinula aculeata* (E. G. Ingold).

Middlesex (21):—*Pisidium hibernicum*, *P. pulchellum* (J. E. Cooper).

Oxford (23):—*Helicella caperata* seg. (J. E. Cooper), *Pisidium personatum* (J. W. Grensted).

Bucks (24):—*Helicella caperata* seg. (J. E. Cooper), *Vitrina major* (Burnham Beeches, E. J. Salisbury).

Norfolk E. (27):—*Helicella caperata* seg. (S. S. Pearce).

Norfolk W. (28):—*Helix arbustorum* (W. R. Dawson).

Bedford (30):—*Testacella haliotideia* (E. M. Langley).

Gloucester W. (34):—*Punctum pygmaeum* (C. Upton), *Vallonia excentrica* (J. H. Adams).

Hereford (36):—*Limax cinereoniger*, *Arion subfuscus* (A. E. Boycott).

Warwick (37):—*Helicella caperata* seg. (E. Collier), *Pisidium supinum*, *P. parvulum* (Oxford Canal, C. Oldham).

Salop (40):—*Vallonia costata*, *V. excentrica* (L. W. Grensted), *Helicella caperata* seg., *H. heripensis*, *Carychium minimum*, *Paludestrina jenkinsi*, *Pisidium henslowanum*, *P. hibernicum*, *P. parvulum*, *P. tenuilineatum*, *Sphaerium pallidum* (Shropshire Union Canal, C. Oldham).

Brecon (42):—*Vitrina major* (Cusop, A. E. Boycott).

Radnor (43):—*Helicella caperata* seg. (J. Williams-Vaughan).

Carmarthen (44):—*Paludestrina stagnalis* (J. Williams-Vaughan).

Pembroke (45):—*Helicella caperata* seg. (J. Williams-Vaughan), *Vallonia costata* (A. G. Stubbs), *Paludestrina jenkinsi* (L. B. Langmead).

Cardigan (46):—*Hyalinia lucida* (F. H. Sikes), *Agriolimax laevis*, *Planorbis albus*, *Pisidium hibernicum*, *P. milium*, *P. personatum* (C. Oldham), *Margaritana margaritifera* (R. Cletwr, J. Williams-Vaughan).

Montgomery (47):—*Helicella caperata* seg. (C. Oldham).

Merioneth (48):—*Helicella heripensis* (E. Collier), *Vertigo pusilla* (Dolgelly, C. Oldham: first living Welsh record).

Carnarvon (49):—*Vallonia costata* (J. Hopkinson).

Denbigh (50):—*Zonitoides nitidus*, *Limnaea auricularia*, *L. palustris*, *Planorbis corneus*, *Pl. vortex*, *Pl. fontanus*, *Pl. contortus*, *Bithynia leachii*, *Pisidium lilljeborgi* (Shropshire Union Canal), *P. personatum* (C. Oldham).

Flint (51):—*Acme lineata* (T. Shankland).

Lincoln N. (54):—*Zonitoides excavatus* (W. D. Roebuck), *Ancylus fluviatilis* (H. W. Kew), *Paludestrina confusa* (R. Winckworth and J. E. Cooper).

Leicester (55):—*Helicella heripensis* (C. E. Y. Kendall).

Derby (57):—*Ashfordia granulata*, *Vallonia pulchella* seg. (W. E. Alkins).

Lancs S. (59):—*Helicella heripensis* (R. Standen), *Vallonia costata*, *Pisidium hibernicum* (L. W. Grensted), *Pyramidula rupestris* (W. E. Alkins).

Lancs W. (60):—*Helicella caperata* seg. (W. E. Alkins).

Yorks S. E. (61):—*Pisidium casertanum*, *P. henslowanum*, *P. supinum* (A. Smith), *P. milium* (H. Sowden).

Yorks N. E. (62):—*Testacella haliotide* (J. A. Hargreaves), *Valvata cristata* (B. Hudson).

Yorks S. W. (63):—*Balea perversa* (F. Booth).

Yorks M. W. (64):—*Pisidium milium* (A. Smith).

Yorks N. W. (65):—*Hyalinia lucida* (G. Fisher).

Northumberland S. (67):—*Helicella caperata* seg. (A. E. Boycott).

Cumberland (70):—*Vertigo moulinsiana* (W. J. Farrer, most northerly record in Britain).

Kirkcudbright (73):—*Pisidium personatum* (Perth Museum).

Ayr (75):—*Vertigo edentula* (A. Shaw), *Acme lineata* (R. Godfrey).

Lanark (77):—*Pyramidula rupestris* (D. Robertson).

Selkirk (79):—*Physa fontinalis* (E. Crapper).

Berwick (81):—*Pisidium casertanum* (Perth Museum).

Edinburgh (83):—*Pisidium casertanum* (R. Sowden).

Fife (85):—*Pisidium casertanum*, *P. personatum* (E. Crapper).

Stirling (86):—*Agriolimax lævis* (G. Nelson).

Perth M. (88):—*Pyramidula rupestris*, *Hygromia striolata*, *Valvata cristata*, *Planorbis nautilus*, *Pisidium obtusale* (H. Coates), *P. pulchellum* (Perth Museum), *P. personatum*, *P. nitidum*, *P. milium*, *P. subtruncatum*, *P. hibernicum* (E. Crapper).

Perth N. E. (89):—*Vertigo minutissima* (Kinnoull Hill), *Pisidium personatum*, *P. obtusale* (H. Coates), *P. casertanum*, *P. nitidum*, *P. subtruncatum* (E. Crapper), *P. milium*, *P. lilljeborgi* (Perth Museum).

Forfar (96):—*Pisidium casertanum*, *P. personatum*, *P. subtruncatum*, *P. nitidum*, *P. milium* (E. Crapper).

Kincardine (91):—*Hyalinia lucida* (W. Turner), *Succinea elegans* (F. Booth).

Aberdeen S. (92):—*Succinea elegans* (F. Booth).

Aberdeen N. (93):—*Helicella virgata* in Banff Museum labelled "Fraserburgh."

Easternness (96):—*Vertigo edentula* (W. Evans).

Westernness (97):—*Zonitoides excavatus*, *Acanthinula aculeata* (F. Booth), *Margaritana margaritifera* (R. Moidart, J. Abernethy), *Pisidium milium*, *P. obtusale* (Perth Museum).

Main Argyll (98):—*Pisidium personatum* (L. W. Grensted).

Ebudes Mid. (103):—*Planorbis glaber* (W. Evans), *Paludetrina stagnalis* (N. Annandale).

Ross W. (105):—*Limax maximus*, *Acme lineata* (a considerable extension of range northward, R. Godfrey).

Sutherland E. (107):—*Pisidium hibernicum*, *P. nitidum*, *P. lilljeborgi*, *P. personatum* (J. R. Tomlin).

Hebrides (110):—*Arion hortensis* (A. Somerville), *Vallonia excentrica* (F. M. Dyke).

Orkney (111):—*Hyalinia lucida* (J. G. Milne), *Vertigo pygmæa* (J. Waterston).

Shetland (112) :—*Hyalinia lucida* (J. G. Milne).

Donegal E. (119 E.) :—*Pyramidula rupestris* (F. H. Sikes), *Acme lineata* (A. L. Massy).

Meath (123) :—*Vertigo moulinsiana* (P. H. Grierson).

Carlow (128) :—*Milax sowerbyi* (D. R. Pack-Beresford), *Zonitoides excavatus* (R. A. Phillips).

Kilkenny (129) :—*Milax sowerbyi* (J. Carlton), *M. gagates* (J. White).

Queen's Co. (130) :—*Planorbis corneus* (Maryborough, R. A. Phillips).

Longford (133) :—*Hyalinia nitidula* (P. H. Grierson).

Galway N. E. (140 N) :—*Pupa anglica* (R. A. Phillips).

Clare (141) :—*Acme lineata* (P. H. Grierson).

Limerick (142) :—*Punctum pygmaeum*, *Anodonta cygnea* (H. Fogerty).

Tipperary N. (143) :—*Acanthinula aculeata* (R. A. Phillips).

Tipperary S. (144) :—*Paludestrina jenkinsi* (R. A. Phillips), *Acme lineata* (P. H. Grierson).

Cork S.W. (147) :—*Geomalacus maculosus* (R. Winckworth).

Kerry S. (148 S) :—*Acme lineata* (E. Collier).

Vitrina major, a continental species now recognised as British, has a shell similar to *V. pellucida* from which it may be distinguished by a black body, lively manner, a globular muscular swelling on the oviduct and the absence of the multiple small cusps on the extreme marginal teeth (see *Proc. Malac. Soc. London*, vol. xv, page 123). Any dark-bodied *Vitrina* should be sent alive for examination.

ANNUAL REPORT OF THE LEEDS BRANCH.

OF the eleven meetings on the syllabus two of the summer rambles were abandoned owing to bad weather; one was held at Bingley in conjunction with the Yorkshire Naturalists' Union; the second was held at Selby and the third at Agbrigg, near Wakefield. Six meetings were held indoors, and three papers were contributed, one by Prof. Walter Garstang on the "Life History of Lamellaria and Echino-spira," a second by Mr. J. W. Taylor on the "Evolution and Distribution of the Unionidæ," and the third by Mr. Hy. Crowther, on "Conchology as an Ethnological Study." There have been special displays of *Limnæa pereger*, *Unionidæ* and *Helix nemoralis* and its allies. Mr. J. H. Lumb is our President.

F. BOOTH. *Hon. Sec.*

ANNUAL REPORT OF THE LONDON BRANCH.

ELEVEN evening meetings have been held. They have been well-attended and the exhibits have been varied and good.

The President, Mr. A. S. Kennard, has contributed very interesting notes on the species exhibited; so also has Mr. A. E. Salisbury, and at the meeting in May Col. A. J. Peile explained the *Pacilozonites* and other land shells of Bermuda, and exhibited photographs of the localities where some of the species were found as

well as photographs and maps of many interesting and historical places in the islands. Only two field meetings were held, one in May and one in July. The effect of the long drought in 1921 and early in 1922 was most marked, so that it was considered advisable to postpone further outings till next season.

J. C. DACIE, *Hon. Sec.*

ANNUAL REPORT OF THE NORTH STAFFORDSHIRE BRANCH.

THE only interesting records to report for the past year are the re-discovery by Mr. Alkins of *Acanthinula lamellata*, after many years, in its old and only N. Staffs. locality, Cotton Dale, Oakamoor, together with a few specimens of *V. substriata*, a very rare shell in the county.

B. BRYAN, *Hon. Sec.*

514th Meeting, held at the Manchester Museum, November 1st, 1922.

Mr. G. C. Spence in the chair.

New Member Elected.

G. C. Robson, M.A., F.Z.S.

Candidate Proposed for Membership.

Henry Charles Higgins, Keyport, N.J., U.S.A. (introduced by Maxwell Smith and Paul Bartsch).

Papers Read.

"*Helix hortensis* and *H. nemoralis* living in company," by A. K. Lawson.

"*Milax gagates* new to Forfarshire," by A. K. Lawson.

"*Paludestrina jenkinsi* new to Fifeshire (Vice-county 85)," by E. Crapper.

"*Anodonta anatina* new to Perthshire Mid. (Vice-county 88)," by E. Crapper.

"An attempt to pair a Dextral with a Sinistral *Limnæa pereger*," by L. E. Adams, B.A.

"On large *Cochlicella barbara* in Sussex," by H. S. Toms.

Principal Exhibits.

By Mr. A. K. Lawson : Shells to illustrate his paper on *H. hortensis* and *H. nemoralis* ; also *H. striolata* and *H. caperata* from Hele, N. Devon, *H. virgata* and *H. aspersa*, from Ilfracombe, *H. virgata* from Combe Martin.

By Mr. E. Crapper : Shells to illustrate his papers (donated to the Society's Cabinet).

By Rev. L. W. Grensted : *H. nemoralis* v. *castanea* (very dark shells), from near Shaldon, South Devon ; *H. limbata*, from Combe Cellars, S. Devon (large proportion of *albina* form).

The Special Exhibit was *Solaropsis*.

Accounts for the Year ended December 31st, 1922.

Income and Expenditure Account.

[illegible]

Life Membership Fund.

	£	s.	d.		£	s.	d.
To amount of Fund, Jan. 1st,				By Amount of Fund, Dec.			
1922	131	12	11	31st, 1922	150	7	10
„ One Composition Fee ...	6	6	0				
„ Donations by Life Members	5	11	0				
„ Dividends and Interest	6	17	11				
	£150	7	10		£150	7	10

BALANCE SHEET.

<i>Liabilities.</i>			<i>Assets.</i>		
	£	s. d.		£	s. d.
Annual Subscriptions paid in advance	6	10 0	4% Funding Loan, £164 10 11		
Life Membership Fund ...	150	7 10	cost	125	0 0
Balance of Income and Expenditure Account ...	15	11 11	Cash at Bankers	47	9 9
	<u>£172</u>	<u>9 9</u>		<u>£172</u>	<u>9 9</u>

NOTE.—Assets in addition to those set out in the Balance Sheet are (*a*) Library, (*b*) Cabinets and Collections; (*c*) Stock of unsold Publications; (*d*) Annual Subscriptions in arrear.

CHAS. OLDHAM,

Audited and found correct, 3rd January, 1923.

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A. K. LAWSON, }

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THE
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VOL. 17.

JULY, 1923.

No. 2.

COCHLICOPA LUBRICA monst. SINISTRORSUM Westl.

By J. W. TAYLOR, M.Sc.

(Read before the Society, September 2nd, 1922).

THE finding by Mr. F. F. Henson in July of present year, of an excellent specimen of this excessively rare form, in the rejectamenta of the R. Avon, at Rugby, is according to my information the first and only specimen found in the British Isles.

This form is also exceedingly rare in other countries, which, considering the countless number in which they exist and the wide range of the species, is truly remarkable.

Altogether six specimens are known. Two are stated by Dr. Pilsbry to be "known" from the continent, one is recorded by M. Locard from rejectamenta of the Rhone near Lyons, a fourth is recorded by Westerlund from Tunguska, Siberia, a fifth is said to have been found at Hellerup, Denmark, and Mr. Henson's find, which he has generously placed in my collection, brings the known number up to six.

—♦♦♦—

Milax gagates new to Forfarshire.—Whilst at Arbroath in June, 1920, Mr. E. Crapper and I made a small collection of slugs which were kindly identified by Mr. Chas. Oldham. Amongst these were specimens of *M. gagates*, which appear to form a new record for Forfarshire.—A. K. LAWSON. (Read before the Society, November 1st, 1922).

Vertigo alpestris and V. pusilla in Merioneth.—Nine years ago I recorded the occurrence of *V. alpestris* at Dolgelly on the strength of a single specimen taken on a wall by the roadside near the Torrent Walk (*J. of C.*, vol. 14, p. 138). I failed to find the species again at this spot during several subsequent years, but in September, 1921, took it in considerable numbers in old ivy on the top of a wall about a mile out of Dolgelly, on the Towyn road. In June and again in October this year I brought away some bags of dead ivy-leaves and débris from this wall and from another on the Dolgelly-Llanelltyd road, and in each case found, in addition to many examples of *V. alpestris*, several *V. substriata* and many *V. pusilla*, a species which has not apparently been found hitherto in a living state in Wales. The molluscan association in the matted ivy on the top of these walls comprised in addition *Pyramidula rotundata*, *Hygromia striolata*, *Helix aspersa*, *Punctum pygmæum*, *Arianta arbustorum*, *Acanthinula aculeata*, *Pupa cylindracea*, *Sphyradium edentulum*, and *Clausilia bidentata*.—CHAS. OLDHAM. (Read before the Society, December 6th, 1922).

PATELLA DEPRESSA Pennant.

BY J. R. LE B. TOMLIN, M.A.

(Read before the Society, September 2nd, 1922).

PENNANT described his *Patella depressa* in Brit. Zool., iv, p. 124, pl. lxxxix, f. 146, 1777, but neither this figure nor the one referred to in Lister is very satisfactory. The name was subsequently referred by some authors to *P. vulgata* L., by others to *P. athletica* Bean.

In his article on the Pennant types Smith very properly refers *P. depressa* to "*P. vulgata* var.," but it is not quite obvious from this exactly what *depressa* Penn. is, and the object of the present note is to point out that the type specimen, which is now before me, is not the same as *athletica* Bean, as is evidently² intended by the compilers of the last British Marine List, but is apparently the depressed *Siphonaria*-like form of *vulgata* which Jeffreys called var. *intermedia*. Pennant's specimen might have been collected yesterday, instead of having a history that goes back 146 years: its apex is orange, the spatula is greenish, and the shell has broad black rays separated by narrow white ones which tend to become trifid when approaching the margin.

The name *depressa* will thus supersede *intermedia* and the "China" limpet will revert to the name *athletica* Bean, whether it be regarded as distinct from *vulgata* or only a variety. Bean described his species in the appendix to Brit. Marine Conchology (Thorpe), p. 264, f. 101, 1844.

There is also a ³*Patella depressa* of Gmelin (1791), and a ⁴second one of the same author quoted by error for ⁵*deflexa* Helbling. It is worth while noting that *deflexa* Helbling is the Cape shell usually known as *Siphonaria variabilis* Krauss.

Acanthinula lamellata var. **albida** in Ireland.—On July 12th, 1919, I found two living specimens of this rare form on a small decaying log in Togher Wood, near Maryborough, Queen's County. At the time I could not wait to search for further specimens, and no opportunity of doing so has occurred since then, so that whether it is general in the locality or not remains to be seen. The type form is plentiful in other parts of the same wood and *Hygromia fusca* was very abundant, resting high up on the leaves of the Blrd Cherry (*Prunus avium*).—R. A. PHILLIPS. (Read before the Society, December 6th, 1922).

¹ *J. of C.*, xiv, 38.

² *J. of C.*, x, 16.

³ *Syst. Nat.*, p. 3694.

⁴ *Id.*, p. 3698.

⁵ *Abh. Privatges. Böhmen*, iv, 108, 1779.

VARIATION OF *ENA OBSCURA* (Müller).

By W. E. ALKINS, M.Sc.

(Read before the Society, September 8th, 1920).

For the purpose of the present investigation a series of five hundred specimens of *Ena obscura* (Müller) was collected from a wall of Millstone Grit on the side of the Star Road, Oakamoor, North Staffs. This wall runs by the road from Oakamoor to the Star Inn, and its course lies wholly on the Third Grit which forms the escarpment of the east side of Star Wood. It is fairly well covered with moss and grass, and is overhung by beeches and sycamores. Associated species are:—*Arion ater* (L.), *Agriolimax agrestis* (L.), *Limax arborum* B.-C., *L. maximus* L., *Pyramidula rotundata* (Müller), *Hygromia hispida* (L.), *Helicigona arbustorum* (L.), *Balea perversa* (L.), and *Clausilia laminata* (Montagu).

The whole series of just over five hundred shells was collected in two days in May, 1920, only mature specimens being taken. They were measured in the usual way by means of an optician's sliding gauge; each measurement was made to the nearest one-tenth of one millimetre. The position of the measured axes may be defined as follows:—

Altitude: from the apex to the farthest extremity of the lip.

Major diameter: the greatest width of the shell, in a plane parallel to that containing the mouth.

The value of each axis was noted for each shell, and from the results the value of the ratio Major Diameter/Altitude was calculated in every case. The distribution of each of the measured axes and of the ratio, and the correlation of altitude and major diameter, has been studied.

Results:—(a) Distribution of Altitude and Major Diameter. In Table I below are shewn the distribution of Altitude and Major Diameter throughout the series of shells.

TABLE I. DISTRIBUTION OF ALTITUDE AND MAJOR DIAMETER.

Altitude, mm.	...	...	7·2	7·3	7·4	7·5	7·6	7·7	7·8	7·9	8·0	8·1
No. of Specimens	...	...	1	...	2	2	3	4	7	18	22	33
Altitude, mm.	...	...	8·2	8·3	8·4	8·5	8·6	8·7	8·8	8·9	9·0	9·1
No. of Specimens	...	...	42	51	57	69	43	35	33	28	23	10
Altitude, mm.	...	...	9·2	9·3	9·4	9·5	...	...	...	...	...	...
No. of Specimens	..	...	7	6	3	1	...	...	...	...	...	...
Major Diameter, mm.	...	...	3·3	3·4	3·5	3·6	3·7	3·8	...	...	...	...
No. of Specimens	...	...	14	159	222	89	14	2	...	...	...	...

The range over which the Altitude of the shells has been found to vary is somewhat astonishingly great, yet notwithstanding this, and in spite of the relatively large number of classes into which the shells have been divided in respect of Altitude, the distribution curve for this particular dimension is quite a smooth one. The Major Diameter shews a much smaller variability.

The means and other constants for the two distributions are :

	ALTITUDE.	MAJOR DIAMETER.
Mean, mm.	8.4670	3.4872
Standard deviation, mm.	0.3660	0.0860
Coefficient of Variation	4.317	2.466
Standard error of mean, mm.	0.01367	0.003846

In fig. 1 are shewn the frequency polygons for the two dimensions.

(b) Distribution of the Ratio: $\frac{\text{Major Diameter.}}{\text{Altitude.}}$ Table II below shews the distribution of the ratio $\frac{\text{Major Diameter}}{\text{Altitude}}$ for the series of shells, while the corresponding frequency polygon is given in fig. 2.

TABLE II. DISTRIBUTION OF RATIO : $\frac{\text{MAJOR DIAMETER.}}{\text{ALTITUDE.}}$

Ratio $\frac{\text{Major Diameter.}}{\text{Altitude.}}$	0.36	.37	.38	.39	.40	.41	.42
No. of Specimens ...	2	4	16	43	113	118	103
Ratio $\frac{\text{Major Diameter.}}{\text{Altitude.}}$	0.43	.44	.45	.46	.47	.48	...
No. of Specimens ...	60	22	11	5	2	1	...

Fig. 2 shews that the ratio gives a perfectly smooth, almost ideal, slightly asymmetrical, continuous variation curve. The constants for the distribution are :—

Mean Ratio	...	...	...	0.41208
Standard Deviation	...	...	...	0.01723
Coefficient of Variation	...	...	...	4.18
Standard error of mean	...	...	...	0.00077

(c) Correlation of Altitude and Major Diameter. The correlation table for Altitude and Major Diameter is given in full in Table III, and the correlation graph is shew in fig. 3. It is evident from a glance at fig. 3 that the correlation of the two dimensions is very far from precise, but that there is, nevertheless, a definite tendency towards the association of high values of Altitude with high values of Major Diameter (positive correlation).

The coefficient of correlation has the value +0.3685, and the equations of regression are :—

TABLE III. CORRELATION OF ALTITUDE AND MAJOR DIAMETER.

ALTITUDE, MM.	MAJOR DIAMETER, MM.							Mean Dia., mm.	Standard Deviation.	Co-effi- cient of Variation.
	3·3	3·4	3·5	3·6	3·7	3·8				
7·2	1	...	...	...	...	...	3·3	...	...	...
7·3	...	...	...	...	...	...	...	...	...	...
7·4	...	...	1	1	...	...	3·55	·05	1·41	...
7·5	...	1	1	...	...	...	3·45	·05	1·45	...
7·6	1	1	1	...	...	...	3·40	·08165	2·40	...
7·7	...	2	2	...	...	...	3·45	·05	1·45	...
7·8	...	3	4	...	...	...	3·457	·04948	1·43	...
7·9	2	9	5	2	...	...	3·439	·08259	2·40	...
8·0	3	10	6	2	1	...	3·445	·09875	2·87	...
8·1	1	20	10	2	...	...	3·439	·06485	1·89	...
8·2	4	16	20	2	...	...	3·448	·07315	2·12	...
8·3	1	22	22	5	1	...	3·467	·07584	2·19	...
8·4	...	25	26	5	1	...	3·468	·07050	2·03	...
8·5	...	18	34	16	1	...	3·500	·07421	2·12	...
8·6	1	10	20	8	4	...	3·509	·09354	2·67	...
8·7	...	5	18	12	...	...	3·520	·06676	1·90	...
8·8	...	5	18	8	2	...	3·521	·07690	2·18	...
8·9	...	3	14	9	1	1	3·539	·08593	2·43	...
9·0	...	3	13	5	2	...	3·526	·07922	2·25	...
9·1	...	2	3	4	...	1	3·550	·1118	3·15	...
9·2	..	...	4	2	1	...	3·557	·07284	2·05	...
9·3	...	2	...	4	...	...	3·533	·09428	2·67	...
9·4	...	2	...	1	...	...	3·467	·09428	2·72	...
9·5	...	...	...	1	...	...	3·6	...	...	...
Mean altitude ; mm.	8·029	8·343	8·488	8·662	8·664	9·0				
Standard deviation ; mm.	·3193	·3343	·3365	·3612	·3038	·10				
Coefficient of variation	3·98	4·01	3·96	4·17	3·51	1·11				

(1). $A = 3·00 + 1·568 D$; Standard error, $\pm 0·340$.

(2). $D = 2·754 + 0·0866 A$; Standard error, $\pm 0·080$.

It is readily seen on inspection of Table III that the ratio $\frac{\text{Major Diameter}}{\text{Altitude}}$ diminishes steadily as the Altitude increases.

SUMMARY.

Measurement of a series of five hundred mature specimens of *Ena obscura* (Müller) taken in May, 1920, from a Millstone Grit wall on Millstone Grit, near Oakamoor, North Staffs., has shown that :—

- The species as represented by this series of specimens is perfectly homogeneous.
- The Altitude is subject to much greater variation than the Major Diameter.
- The correlation of Altitude and Major Diameter is low, the coefficient of correlation having in the case of the present series the value : $+ 0·3685$.
- The ratio $\frac{\text{Major Diameter}}{\text{Altitude}}$ varies from 0·36 to 0·48, and shows a marked tendency to diminish as the Altitude increases.

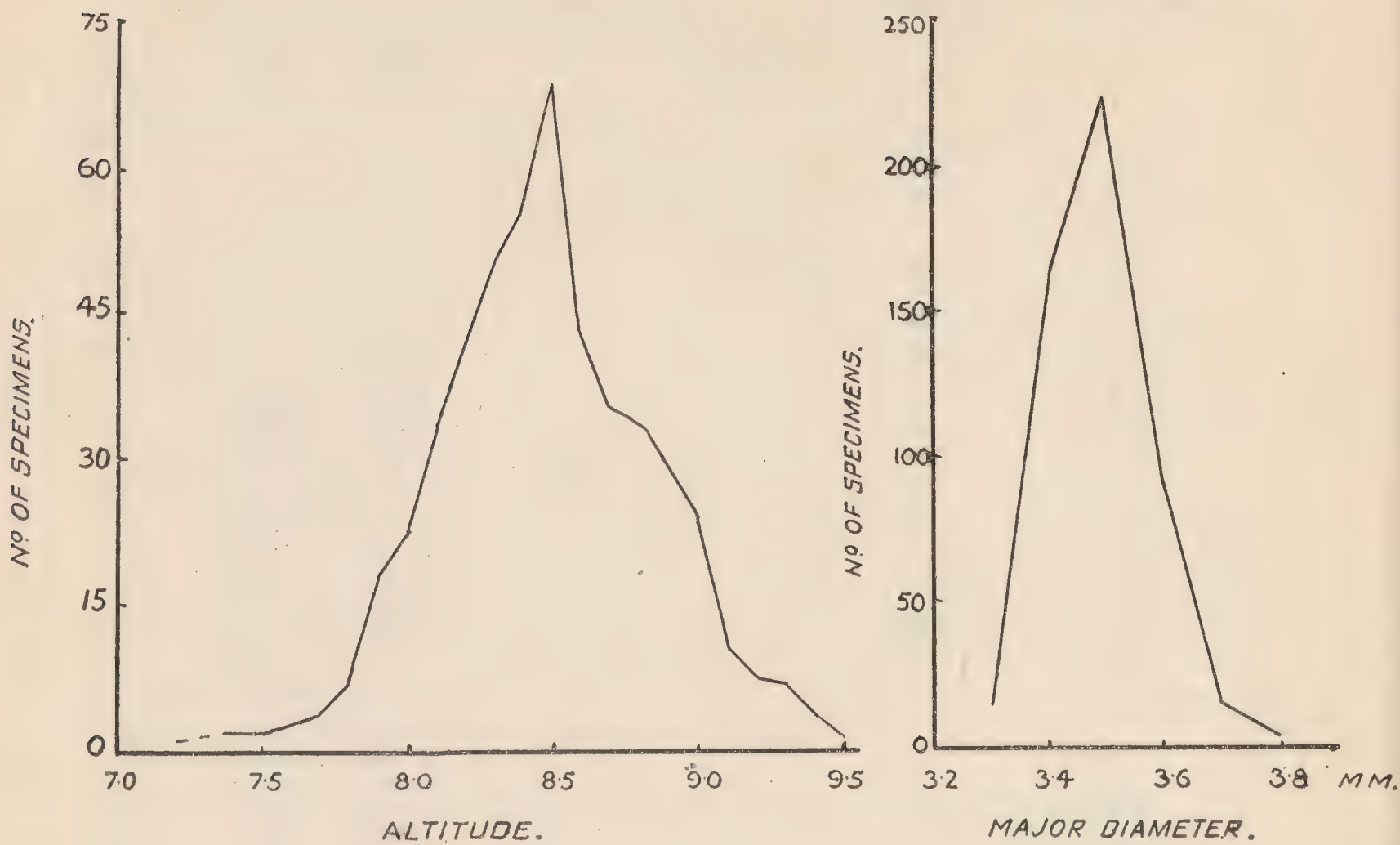


FIG 1. DISTRIBUTION OF ALTITUDE AND MAJOR DIAMETER.

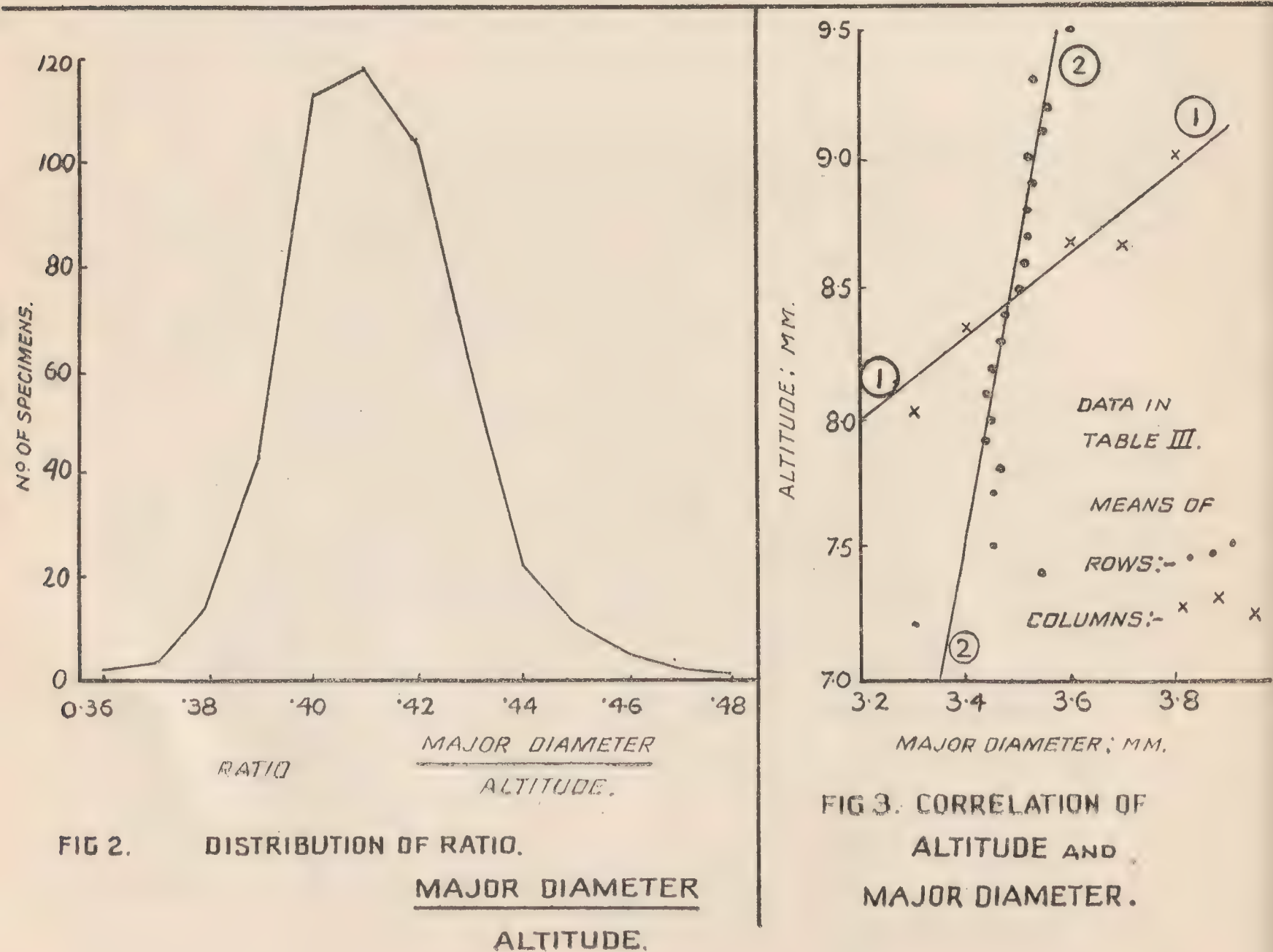


FIG 2. DISTRIBUTION OF RATIO.
MAJOR DIAMETER
ALTITUDE.

FIG 3. CORRELATION OF
ALTITUDE AND
MAJOR DIAMETER.

VITRINA MARCIDA Gould.

BY PROF. T. D. A. COCKERELL.

(Read before the Society, April 7th, 1923).

IN 1921 I found this interesting species common under stones at Villa Baleira, Port Santo. With it occurred *Milax gagates* var. *plumbea* Moq., pale grey with light foot. I also found *V. marcida* on the top of the Pico Castello, but not common. The animal is about 35 mm. long, translucent whitish, with the oculiferous tentacles dark grey at end ; a broad dusky band on each side of anterior part of body, breaking up into spots posteriorly ; body behind shell sharply keeled, elevated, the keel pale reddish, the sides speckled with grey ; mantle with strongly corrugated surface, and more or less heavily mottled with grey ; a black longitudinal band over respiratory orifice. Shell entirely covered by mantle, but the spire can be seen through it. The mantle has a cleft (with the edges contiguous) running obliquely across from respiratory orifice, passing anterior to spire. Sole colorless ; no caudal gland. In alcohol the mantle contracts, exposing the shell. The shell has the first whorl beautifully ornamented with spiral lines of minute punctures, and because of this and the greatly developed mantle there is no relation to the African *Calidivitrina* of Pilsbry. The affinities of *V. marcida* are obviously with the European species.

Limnæa stagnalis in Midlothian.—*L. stagnalis* is not a fresh addition to the list of Edinburgh county, as Mr. Crapper suggests (*Journ. Conch.*, June, 1922, p. 301). Professor Edward Forbes found and recorded the species from a pond in the Botanic Gardens in Edinburgh before 1836 ; but because Forbes's identification was not "authenticated," the record finds no place in the "Census." Readers of the "Census" are apt to forget that it does not profess to give a complete list of mollusca in any district, but only mentions species of which examples have been submitted to a referee ; and that the so-called first records of Mr. Roebuck's papers were only records of first "authenticated" specimens, and may have been preceded by perfectly satisfactory records made previously by competent systematists. The presence of *Limnæa stagnalis* in Duddingston Loch, now recorded by Mr. Crapper, is, I am sure, due to a recent introduction of the species. I have been receiving well-grown specimens from this place, where they were then abundant, since the early months of 1921, some of the specimens being placed in the small fresh water aquarium in the Natural History Department of the Royal Scottish Museum. But the Loch had been examined by many naturalists, including Edward Forbes, Thomas Scott and William Evans, and since none of these found *L. stagnalis*, it is safe to assert that till at any rate twenty years ago it did not occur there.—JAMES RITCHIE. (Read before the Society, September 2nd, 1922).

ON SOUTH AFRICAN MARINE MOLLUSCA WITH DESCRIPTIONS OF SEVERAL NEW SPECIES.

BY J. R. LE B. TOMLIN, M.A.

(Read before the Society, December 6th, 1922).

It is now twelve years since Mr. Edgar A. Smith contributed to the Annals of the Natal Museum the last of the papers in which he collected into convenient form the latest corrections and additions to the list of S. African Marine Mollusca. I have been asked to continue his work in this connexion, and have had at my disposal some notes which he left unpublished.

It may be useful here to state once more, for future reference, that a practically complete list—sometimes known as the official list—may be compiled from the following five sources :—

- (1) Sowerby's Marine Shells of South Africa.
- (2) Appendix to (1).
- (3) "A List of Species, etc.," by E. A. Smith in Proc. Malac. Soc., V, 354-402, 1903.
- (4) "On S. African Marine Mollusca, etc.," by E. A. Smith in Ann. Natal Govt. Mus. I, 19-71, 1906.
- (5) "On S. African Marine Moll., etc.," by E. A. Smith in Ann. Natal Mus. II, 175-220, 1910.

One very important and voluminous contribution to the subject has appeared in the period of twelve years alluded to above, I mean Bartsch's Report on the Turton Collection. This contains descriptions of a very large number of new species, but gives rise to many corrections and criticisms, and will be best dealt with in a separate paper.

CEPHALOPODA.

Loligo bartramii Lesueur.

Journ. Acad. Nat. Sci., Philad., ii, p. 90, pl. vii, March, 1821.

HAB.—No locality is given by Lesueur, but Orbigny records it as taken by Dussumier at the Cape (Sagra's Hist. Cuba, Moll., i, p. 62).

Sepia zanzibarica Pfeffer.

Abh. Naturw. Verein Hamburg, viii, Heft 2, no. 6, p. 9, f. 11, 11a, 1884; Smith, Pr. Malac. Soc., Lond., xii, p. 21.

HAB.—Tonga (Burnup); Isipingo (Alexander).

S. acuminata Smith.

Pr. Malac. Soc., Lond., vii, p. 21, pl. ii, f. 3, 4, March 20, 1916.

HAB.—Port Elizabeth (Ponsonby and Spencer); Tonga (Burnup).

S. papillata Quoy & Gaimard.

Voy. Astrolabe, Zool., ii, p. 61, pl. i, f. 6-14, 1832.

HAB.—Cape of Good Hope (Q. and G.); Port Elizabeth (Ponsonby and Spencer); Tonga (Burnup).

S. incerta Smith.*S. burnupi* Hoyle (partim).

Pr. Malac. Soc., Lond., xii, p. 23, pl. ii, f. 6, March 20, 1916.

HAB.—Tongaat (Burnup) ; Port Elizabeth (Spencer).

S. confusa Smith.*S. burnupi* Hoyle (partim).*l.c.* p. 24, pl. ii, f. 7, 8, March 20, 1916.

HAB.—Tongaat (Burnup) ; Port Elizabeth (Spencer).

S. australis Quoy and Gaimard.Voy. Astrolabe, Zool., ii, p. 70, pl. v, f. 3-7, 1832 ; Smith, *l.c.*, pl. ii, f. 9.*S. capensis* Orbigny, Hist. Nat. Céph. Acétab., i, p. 278, pl. vii, f. 1-3, pl. xii, f. 7-11, pl. xvii, f. 18-19, 1848.*S. sinope* Gray, Cat. Cephal. p. 106, 1849.

HAB.—Agulhas Bank (Q. and G.) ; Port Elizabeth (Burnup).

Orbigny erroneously claimed that his name *capensis* dated from 1826. Gray proposed the name *sinope* under the idea that *S. australis* Orb. (1848) antedated *australis* Q. & G.**S. insignis** Smith.*l.c.* p. 25, pl. ii, f. 10, March 20, 1916.

HAB.—Tongaat (Burnup).

GASTROPODA.

Limacina inflata (Orbigny).*Atlanta inflata* Orb., Voy. Amér. Mérid. V, pt. 3, p. 174, pl. xii, f. 16-19, 1836.

HAB.—Off the Cape Province (Burnup) ; off Cape Town, stations 91, 117, 118 (Meisenheimer).

L. bulimoides (Orbigny).*Atlanta bulimoides* Orb., *l.c.* p. 179, pl. xii, f. 36-38, 1836.

HAB.—Off the Cape Province in numbers (Burnup).

L. helicina (Phipps).*Clio helicina* Phipps, Voy. towards N. Pole, p. 195, 1774.

HAB.—Off Cape Town, station 91 ; S. of Agulhas Bank, station 112 (Meisenheimer).

L. helicoides Jeffreys.

Ann. Mag. N.H., ser. 4, xix, p. 338, April, 1877.

HAB.—S. of Cape Town, station 117 (Meisenheimer).

Peraclis moluccensis Tesch.

Siboga-Exp. monogr. 52, p. 16, pl. i, f. 7-10, April, 1904.

HAB.—S. of Cape Town, station 117 (Meisenheimer).

Clio andreæ (Boas).*Cleodora andreæ* Boas, K. Dansk. Vidensk. Selsk. Skr. ser. 6, iv, p. 80, pl. i, f. 1, pl. ii, f. 12, pl. iv, f. 49, pl. v, f. 92, 1886 (Spolia Atlantica).

HAB.—W. of Cape Town, station 91 (Meisenheimer).

C. pyramidata Linné.

Syst. Nat., ed. xii. p. 1094, 1767.

HAB.—W. of Cape Town, stations 90, 91; S. of Cape Town, station 117; S. of Agulhas Bank, station 112 (Meisenheimer).

C. cuspidata (Bosc).

Hyalæa cuspidata Bosc, Hist. Nat. Coq. ii, p. 241, pl. ix, f. 5-7, 1802.

HAB.—W. of Cape Town, station 90; S. of Cape Town, station 117.

C. capensis Rang.

Ann. Sci. Nat., v, p. 286, pl. vii, f. 3, 4, July, 1825.

HAB.—Agulhas Bank.

Cavolinia gibbosa (Orbigny).

Hyalæa gibbosa Orb., l.c. p. 95, pl. v, f. 16-20, 1836.

HAB.—Scottburgh (Burnup); off Cape Town, stations 91, 115, 117 (Meisenheimer).

C. angulata (Souleyet).

Hyalæa angulata Soul., Voy. Bonite Zool. ii, p. 152, pl. v, f. 1-6, 1852.

HAB.—Port Shepstone, Kelso Junction and Scottburgh (Burnup).

C. inflexa (Lesueur).

Hyalæa inflexa Lesueur, Nouv. Bull. Sci. Soc. Philom., iii, p. 285, pl. v, f. 4, 1813.

HAB.—Off Cape Town, stations 91, 112 (Meisenheimer); Natal, Kelso Junction, Port Shepstone (Burnup); Isipingo (Alexander).

C. uncinata (Orbigny).

Hyalæa uncinata Orb., l.c. p. 93, pl. v, f. 11-15, 1836.

HAB.—Port Shepstone (McClelland).

Cymbulia sibogæ Tesch.

Siboga-Exp. monogr. 52, p. 54, pl. iii, f. 88-90, April, 1904.

HAB.—Port Elizabeth, station 102 (Meisenheimer).

Gleba cordata Forskål.

Icones Rer. Nat., pl. xliii, f. D, 1776.

HAB.—Off Cape Town, station 91 (Meisenheimer).

Desmopterus papilio Chun.

Sitzber. preuss. Akad. Wiss. Berlin, 1889, p. 540, pl. iii, f. 11-14.

HAB.—Off Cape Town, stations 90, 91, 117; Port Elizabeth, station 102 (Meisenheimer).

Spongiobranchæa australis (Orbigny).

Hyalæa australis Orb., l.c. p. 117, pl. viii, f. 9-11, 1836.

HAB.—Agulhas Bank, station 3; off Cape Town, station 112 (Meisenheimer).

According to Hedley in Austral. Antarctic Exp., vol. iv, pt. i, p. 64, this name is a synonym of the earlier *Cliodita caduceus* Q. & G.

Clione limacina (Phipps).

Clio limacina Phipps, Voy. towards N. Pole, p. 194, 1774.

HAB.—Agulhas Bank, station 3 (Meisenheimer).

Cylichnella bistriata Tomlin.

Journ. Conch., xvi, p. 87, f. 1, January, 1920.

HAB.—Port Alfred (Turton).

Cylindrobulla pusilla G. & H. Nevill.

Cylindrobulla pusilla G. & H. Nevill, J. Asiatic Soc., Bengal, vol. xxxviii, pt. ii, no. 2, p. 68, pl. xiii, f. 2-2c (1869); Pilsbry, Man. Conch., vol. xv, p. 382, pl. xlii, f. 24-26.

HAB.—Port Shepstone, Natal (Burnup); Ceylon (Nevill).

This may be the species quoted by Sowerby¹ as *Cylindrobulla fragilis* Jeffreys,² originally described from off Spezia in Italy. That form, however, appears to be narrower and more truncate anteriorly. *C. pusilla* is smaller and more slender than *C. sculpta* of G. & H. Nevill, which also occurs on the Natal coast.

Parviterebra separanda sp. nov.

Terebra (Mazatlanian) thyræa Smith (non Melvill), Pr. Malac. Soc., Lond., v, p. 361.

This species was identified by Smith with *thyræa* Melv. from Karachi and the Mekran Coast, for which see Mem. and Proc. Manchester Lit. and Phil. Soc., xli, pt. 3, no. 7, p. 10, pl. vi, f. 13, 1897. There is an undeniable likeness, but the Cape shell, for which we now propose the name *separanda*, can readily be separated by the following points: its whorls are much flatter and not shouldered as are those of *thyræa*; the incised spiral lines are further apart except on the upper third of each whorl, where they suddenly become much more numerous and closer together; the longitudinal ribs are absolutely straight and parallel to the axis.

Length 8.5 mm.; diam. max. 3 mm.

HAB.—Durban and Port Shepstone (Burnup).

TYPE.—In British Museum.

Conus beckeri Sowerby.

Pr. Malac. Soc. Lond., ix, p. 352, text-figures, 9 September, 1911.

HAB.—St. Francis Bay (Becker).

Mangilia shepstonensis Smith.

Ann. Natal Mus., iii, pt. 1, p. 1, pl. i, f. 1, 25 September, 1914.

HAB.—Port Shepstone.

Marginella pachista Tomlin.

Journ. Conch., xiv, p. 101, text-figures, 1 October, 1913.

¹ Marine Shells S. Africa, p. 53.

² Ann. Mag. Nat. Hist., vol. xvii, p. 188, pl. ii, f. 16-17 (1856) as *Cylichna fragilis*.

HAB.—East London and Umkomaas (Burnup) ; Tongaat (Alexander).

M. aphanospira Tomlin.

l.c., text-figures, 1 October, 1913.

HAB.—Port Shepstone (Burnup).

M. perla Marrat.

Journ. Conch., i, p. 136, 1876.

Marginella biplicata Krauss, Archiv f. Naturgesch. 1852, i, p. 37, 1852 (non Risso, 1826).

M. (Glabella) chrysea Watson, "Challenger" Rept. Gasteropoda, p. 267, pl. xvi, f. 8, 1886.

For this synonymy see Pr. Malac. Soc., Lond., xii, pp. 254 sqq., and Journ. Conch., xiv, p. 289.

M. biannullata (Fabricius).

Kgl. Danske Vidensk. Selskabs Skrift., ii, p. 57 (*Voluta*), 1826.

M. zonata Kiener, Coq. Viv., *Marginella*, p. 41, pl. xiii, f. 4, 1841 (non Swainson, 1840).

M. zonata var. *bilineata* Krauss, Südafr. Moll., p. 126, pl. vi, f. 22, 1848.

M. dunkeri Krauss, *l.c.*, pl. vi, f. 23, 1848.

Having now had an opportunity of studying Fabricius' original description, I have no doubt that Martens is right in thus identifying *Voluta biannullata*. After examining some hundreds of specimens I see no possibility of separating *zonata* and *dunkeri* specifically. In Journ. Conch., xiv, p. 80, a sinistral specimen is recorded from Cape Town.

M. brocktoni Shackleford.

Ann. S. Afr. Mus., xiii, pt. 3, p. 98, text-figures, 7 May, 1914.

HAB.—Cape Point, N. 50°, E. 18½ m., 180 f.

M. kerochuta Shackleford.

l.c., p. 97, text-figures, 7 May, 1914.

HAB.—Cape Point, 135 f.

M. bicatenata Sowerby.

Ann. Mag. N.H., ser. 8, xiv, p. 477, pl. xix, f. 7, December, 1914.

M. tomlini Shackleford, Ann. S. Afr. Mus., xiii, p. 193, text-figures 3, 4, 6 October, 1916.

I have been able to compare the types of these two and can vouch for their absolute identity; that of *tomlini* was dredged off Cape St. Blaize in 105 f.; that of *bicatenata* is queried by Mr. Sowerby from Goree. I have no hesitation in rejecting the doubtful Senegal locality, and I also think that there may have been some confusion in quoting this shell from the Denans collection, and that it may have been one the "Marine Investigation" shells.

M. barnardi Tomlin.

Pr. Malac. Soc. Lond., xiii, p. 65, April, 1919.

M. taylori Shackleford, Ann. S. Afr. Mus., xiii, p. 193, text-figures 1, 2, 6 October, 1916 (non *taylori* Olsson, 24 July, 1916).

HAB.—Off Cape St. Blaize. 108 f.

M. aphanacme Tomlin.

Journ. Conch., xv, p. 306, pl. x. f. 4, 1 September, 1918.

HAB.—Port Alfred (Turton).

M. ithychila Tomlin.

l.c., pl. x, f. 5, 1 September, 1918.

HAB.—Port Alfred (Turton).

M. attractus Tomlin.

l.c., pl. x, f. 6, 1 September, 1918.

M. fusiformis Hinds (erroneously), Smith in Pr. Malac. Soc. Lond., v, p. 364, and Sowerby in Mar. Investigations S. Afr., ii, p. 227.

HAB.—Port Alfred (Hewitt, Turton and others); Port Elizabeth (Crawford); 49 f. E. of Bird Island (Sowerby).

M. walvisiana Tomlin.

Journ. Conch., xvi, p. 88, f. 3, January, 1920.

HAB.—Walvis Bay (Frames, per Burnup). I regret that I omitted to mention, in the original description, that this species was collected by Mr. P. R. Frames.

M. bensoni Reeve.

Conch. Icon., xv, pl. xxvii, f. 158, January, 1865.

M. dulcis Smith, Journ. Malac. xi, p. 32, pl. ii, f. 20, 1904. This synonymy seems pretty certain.

M. muscaria Lamarck is erroneously recorded from the Cape by Mörch in the Yoldi Catalogue, i, p. 119.

M. cylindrica Sow.

Thes. Conch. i, p. 390, pl. lxxvi, f. 134, 1846.

M. multizonata Krauss, Archiv. f. Naturgesch., 1852, i, p. 37, 1852.

M. multizona Sowerby (by error), Mar. Shells S. Afr., p. 21, 1892.

M. ponsonbyi Sowerby, *l.c.*, App., p. 10, pl. vi, f. 2, 1897.

These names all apply to the same species.

M. neglecta Sowerby.

Thes. Conch., i, p. 390, pl. lxxvi, f. 135, 136, 1846.

M. reevei Krauss, Archiv f. Naturgesch., 1852, i, p. 38, 1852.

M. rufula Gaskoin, Ann. & Mag. N.H., ser. 2, xi, p. 359, 1853.

These three names must be united.

M. nebulosa (Bolten).

Mus. Bolt., p. 51 (*Pterygia*), 1798.

V. pyrum Gronovius, Zoophylac., p. 298, no. 1318, pl. xix or ii, f. 13, 14, 1781.

Pterygia flammea Link. Besch. Nat. Samml. Rostock, pt. ii, p. 93, 1807.

Voluta picta Dillwyn, Descr. Cat. Rec. Shells, i, p. 529, 1817.

Marginella nubeculata Lamarck. An. sans Vert., vii, p. 356, Aug., 1822.

M. nubecula Sowerby (by error), Thes. Conch., i, p. 380, pl. lxxv, f. 51, 1846.

Gronovius' specific names are not accepted as binomial and this well-known species must be known as *nebulosa* Bolt.

***Bullia tenuistriata* Tomlin.**

Journ. Conch., xvi, p. 87, f. 4, January, 1920.

HAB.—Port Alfred (Turton).

***Columbella apicibulbus* Tomlin.**

l.c., f. 2, January, 1920.

HAB.—Port Alfred (Turton).

***Lovellona atramentosa* (Reeve).**

Conus atramentosus Reeve, Conch. Icon., vol. I, Suppl. pl. vii, f. 265; Sowerby, Thesaurus, vol. III, p. 47, pl. 200, f. 317; Weinkauff, Conch. Cab., p. 382, pl. 70, f. 18, 19.

HAB.—Scottburgh, Natal (Alexander); Mindoro, Philippines (Reeve); Sandwich Islands (Martens and Langkavel); Mauritius (Martens); Caloundra, Queensland (Iredale); Lifu (Melvill and Standen).

“Only a single shell, almost black, from Scottburgh, differing from the type in being without the white spots above. The white anterior tip appears to be a constant feature, and the protoconch is also whitish. This species, originally described as a Cone from conchological characters, appears to have more relationship to the Columbelloidæ, and together with *Columbella dormitor* Sowerby and *Conus parvus* Pease it appears to constitute a distinct¹ generic group” (Smith).

***Latiaxis fritschi* (Martens).**

Jahrb. Malak. Ges. i, p. 135, pl. vi, f. 3, 1874 (*Rapana*).

Latiaxis rosaceus Smith, Pr. Mal. Soc., v, p. 376, pl. xv, f. 16, 31 October, 1903.

HAB.—Cape (Martens); Port Elizabeth (Smith); Port Alfred (Turton).

We fail to recognise even specific difference in the series that Smith called *Coralliophila rubrococcinea* M. & S. The identification of South African shells with the Persian Gulf species seems erroneous. There is a marked difference in the shape and size of the aperture and in the character of the canal.

***Thais pura* (Smith).**

¹ Pr. Malac. Soc. Lond., xii, 329.

Purpura pura Smith, Proc. Malac. Soc., vol. v, p. 376, pl. xv, f. 21 (1903), var.=*Purpura texturata* Smith, J. Malacol., vol. xi, p. 32, pl. ii, f. 15 (1904).

HAB.—Umkomaas, Kelso Junction, Port Shepstone, Kowie (Burnup); Port Alfred (Turton).

"In describing these two forms it was stated that the labrum in both was thin. More adult specimens in the present collection have the outer lip somewhat thickened. The character of the sculpture in both is similar, and beyond the presence of red dots upon the nodules in *texturata*, there is nothing to distinguish it from *pura*" (Smith).

We have no hesitation in going still further and saying that in our opinion both are simply the young of *capensis* Petit.

Drupa biconica (Blainville).

Purpura biconica Blainville, Nouv. Ann. Mus. Hist. Nat., Paris, i, p. 203, pl. ix, f. 1, 1832.

HAB.—Scottburgh and Durban (Alexander); islands of Luzon and Cebú (Hidalgo); Mauritius (Martens).

Bursa rubeta (Linné).

Murex rana [var.] *rubeta* L., Syst. Nat., ed. x, p. 748, 1758. This name supersedes *Bursa* (*Bufonaria*) *lampas* (Lam.) of Ann. Natal Govt. Mus., i, pt. 1, p. 41. For the history of it see Journ. Conch., xiv, p. 226, xv, p. 41, and Nautilus, xxviii, p. 80.

Cypræa talpa Linné.

Syst. Nat., ed. x, p. 720, 1758.

HAB.—Scottburgh (Miss Johnstone and Alexander, *fide* Burnup); a species of wide range in the Indian and N. Pacific Oceans.

C. tigris Linné.

l.c., p. 721, 1758.

HAB.—A young live shell found at Scottburgh in July, 1918, by Master Guy Falcon and now in Coll. Burnup. The latter also reports that Mr. Falcon has seen a mature dead shell picked up on the beach at Umkomaas. Range similar to that of *talpa*.

C. owenii Sowerby.

Conch. Ill., Cat. Rec. Spec. Cypræadæ, p. 6, pl. iv, f. 12**, 19 October, 1832.

HAB.—Bluff outside Durban Harbour (McClelland). For the dates of the parts in the Conch. Ill. see Pr. Malac. Soc. Lond., viii, p. 333. Roberts (in Tryon's Manual) and Hidalgo both date *C. owenii* 1837. This species is reported from the Mascarene group, Borneo, Philippines, New Caledonia and from Melbourne.

Cerithium nassoide Sowerby.

Thes. Conch., ii, p. 875, pl. clxxxiii, f. 200, 201, 1855.

HAB.—Scottburgh (Coll. Ponsonby in B.M.). A Polynesian species.

Cerithiopsis (Seila) natalensis Smith.

Ann. Natal Mus., iii, pt. 1, p. 2, pl. i, f. 2, September, 1914.

HAB.—Tongaat, Scottburgh and Kelso Junction (Burnup).

Cerithium alexandri n.sp. Fig. 1.

“Shell elongate, acuminate, whitish, covered with crowded spiral series of minute reddish-brown dots, which, falling one under another, form wavy longitudinal series. The spiral series have the appearance of being separated by white spiral threads. The surface to the naked eye appears smooth but under the lens exhibits both spiral striæ and lines of growth. Whorls probably about 15. The apex is broken away. The remaining 10 are concave at the middle, swollen and slightly nodose above and below at the suture which is a little oblique and very conspicuous. The last whorl has a large swollen hump or pseudovarix on the left side and the labrum is also somewhat varicose externally, especially above, near the suture. There is also a slight internal thickening at the upper part near the columellar nodule. The columella is obliquely arcuate, covered with a thin callus which is developed above into a somewhat sharp, thickish nodule, which is continued upon the parietal wall some distance within the aperture. Anterior canal short, oblique, recurved” (E. A. Smith).

Length 34 mm., diam. (max.) 10 mm. Aperture 7.5 mm. in length, 5 mm. in width.

HAB.—Scottburgh, Natal (Alexander). There is also a specimen in the McGregor Museum at Kimberley, labelled “South Africa (J. H. Power)”; and the Cape Town Museum has a dead but fairly fresh shell dredged off Cape Morgan in 34 f.

Cerithiopsis shepstonensis n.sp. Fig. 2.

“Shell narrow, elongate, pale yellowish wax colour, glossy; whorls remaining 11, convex, having four spiral liræ, the uppermost adjoining the suture and less prominent than the others, which are subequal and equidistant. Between the ribs the sculpture consists of fine yet very distinct longitudinal threads producing a finely clathrate appearance. The last whorl has a fifth spiral lira circumscribing the somewhat concave base. Aperture small, exhibiting the external sculpture owing to the thinness of the shell. Columella arcuate, edged with a brown callus; outer lip thin, anterior canal moderately broad, rather deep” (Smith).

Length 8 mm., diam. (max.) 1.5 mm.

HAB.—Port Shepstone, Natal (Burnup); Tongaat (Mrs. English).

The following remarks are also by Smith:—“This is a very beautifully sculptured species, and, although represented by a single specimen only, I do not hesitate to describe it. At first sight the

convex whorls appear to have three spirals, but on closer inspection a fourth is observable above at the suture. The longitudinal threads between the spirals do not cause the latter to be granular. The extreme apex of the spire is broken, but judging from the first of the remaining whorls it would be smooth and glossy. *Seila smithi* of Bartsch¹ apparently closely resembles the present species, but has the longitudinal threads much closer together and more numerous."

Siliquaria wilmanæ Tomlin.

Pr. Malac. Soc. Lond., xiii, p. 16, text-figures, August, 1918.

HAB.—Port Alfred, Jeffreys Bay and East London. This is, no doubt, the shell listed by Sowerby as *S. obtusa* Schum. and by Bartsch as *S. weldi* T.-W.

Littorina africana Philippi.

Abbild., ii, p. 199, pl. iv, f. 10, March, 1847.

HAB.—Cape of Good Hope (Philippi); Algoa Bay (Krauss). This species, which is nearly related to *mauritiana* Lam., has so far escaped recognition on the official list. Tryon quotes it from Krauss' Südafrik. Moll. overlooking Philippi's earlier description. *L. decollata* Philippi, described at the same time, is most probably a very smooth form of the same species. The name has page precedence of *africana*.

Diala² polyaulax n.sp. Fig. 3.

Shell acutely conical, elongate, of a greenish horn-colour, irregularly marked with reddish, interrupted longitudinal streaks; whorls 10, protoconch eroded in all available specimens, the other whorls very regularly spirally grooved, the body whorl having 17 grooves and the penultimate one 8 in the type specimen; the whorls are slightly convex with shallow suture; they are also closely longitudinally ribbed, but this axial sculpture is almost microscopic and visible on the spiral ribs only under a high power; it is more obvious where it crosses the grooves; peristome simple; aperture rather elongate.

Length 5.5 mm., diam. (max.) 2 mm., length of aperture 1.5 mm.

HAB.—Type locality, Isipingo, numerous (Alexander); also at Scottburgh (Id.) and Port Shepstone (Burnup).

The size is variable and specimens occur up to 7 mm. long. The only Cape species at all similar is *D. infrasulcata* Sow., from which the novelty may at once be known by being grooved throughout.

Coriandria durbanensis (Tomlin).

Microsetia durbanensis Tomlin, Journ. Conch., xv, p. 119, text-figure, 1 October, 1916.

HAB.—Durban (Burnup).

For the generic name, *vice Microsetia* preoccupied, see Journ. Conch., xv, p. 221.

¹ Bull. U.S. Nat. Mus., no. 91, p. 115, pl. xii, f. 7 (1915).

² πολυαυλαξ, having many furrows.

Epitonium papyraceum (Boury).

Scala (*Globiscala*) *papyracea* Boury, Journ. de Conch., lx, p. 99, pl. vii, f. 5, 6, 15 December, 1912.

HAB.—Natal (type in Coll. Dautzenberg).

E. turriciforme (Boury).

Scala (*Dentiscala*) *turriciformis* Boury, *l.c.*, p. 276, pl. x, f. 4, 31 May, 1913.

HAB.—South Africa (type in Coll. Paetel, Mus. Zool., Berlin).

Acrilla acuminata (Sowerby).

Scalaria acuminata Sowerby, Thes. Conch., i, p. 106, pl. xxxv, f. 130, 11 April, 1844.

Acrilla thalia Bartsch, U.S. Nat. Mus. Bull., 91, p. 64, pl. xvii, f. 5, 8, 28 July, 1915.

HAB.—Natal (Burnup). This species has been collected at Beira by McClelland; Malacca (Cuming); Bay of Yedo (Lischke).

Phasianella kraussi Smith.

Pr. Malac. Soc. Lond., ix, p. 313, text-figures, 30 June, 1911.

HAB.—Kalk Bay.

Cyclostrema rotundata Sowerby.

Marine Shells S. Africa, p. 45, pl. ii, f. 47, 1892.

Turbo (*Collonia*) *minutus* Sowerby, Journ. Conch., vi, p. 152, pl. iii, f. 9, October, 1889.

A comparison of the types shows that the two names were based on specimens of the same species. *T. minutus* is the earlier name, but is preoccupied by a *Turbo minutus* Michaud.

Stomatella orbiculata A. Adams.

Thes. Conch., ii, p. 837, pl. clxxiv, f. 23, 24, 1854.

HAB.—Algoa Bay (McGregor Mus., Kimberley); Mozambique (Mus. Cuming).

Glyphis levicostata Smith.

Ann. Natal Mus., iii, pt. 1, p. 2, pl. i, f. 3-5, 25 September, 1914.

HAB.—Tonga and Port Shepstone (Burnup).

Helcion pectunculus (Gmelin).

Patella pectunculus Gmelin, Syst. Nat., ed. xiii, p. 3713, 1791.

Helcion pectinatum auctt. (non Linné). Linné described his *Patella pectinata* in the 10th ed. of the Syst. Nat., p. 783, basing it solely on Klein's Tentamen, pl. viii, f. 1. Even the description, short as it is, might make one suspect that it did not apply to the Cape shell universally so-called, especially the words "vertice subcentrali," and reference to Klein's figure shows that *Patella pectinata* L. is a *Siphonaria*, bearing not the slightest resemblance to its supposed exponent in South Africa. Linné's locality is the Mediterranean and it can hardly be doubted that the *Siphonaria* figured is *S. algesiræ* Q. & G. Born was probably the author who first misinterpreted the

Linnean species ; he gives quite a good figure of the Cape shell under his name of *P. pectinata*.

Fortunately we have a long-established name in Gmelin's *Patella pectunculus* to use in place of the discarded *pectinatum*.

PELECYPODA.

Spondylus hystrix Bolten.

Mus. Bolt., 195, 1798.

According to Fulton, Journ. Conch., xiv, p. 334, this name (which he mis-spells *hystrix*) must replace its later synonym *nicobaricus* Sow.

Vulsella attenuata Reeve.

Conch. Icon., xi, pl. i, f. 5, Nov., 1858.

In Pr. Malac. Soc. Lond., ix, p. 309, Smith states that his record of *V. vulsella* L. from Natal (Ann. Natal Mus., ii, pt. 2, p. 213) was incorrect and that the species is in reality *attenuata* Rve.

HAB.—Tongaat, Port Shepstone, Alexandra Junction and Umkomaas (Burnup) ; Red Sea, Suez, Gimsah and Assab (Smith).

Modiola rhomboidea Reeve.

Conch. Icon., x, pl. vi, f. 28, October, 1857.

HAB.—South Head, Tugela River, N. by W. $4\frac{3}{4}$ miles, 25 f. (Sowerby in Marine Invest., iv) ; The Gambia (Mus. Cum.) ; Maskat and Charbar (Melvill & Standen) ; Gulf of Siam (Lynge) ; China (Paetel) ; Japan (Dunker).

Glycymeris castaneus (Lamarck).

An. s. Vert., vi, p. 53, 1819.

HAB.—Table Mountain, N. 79° E., 40 miles, 250 f. (Sowerby in Marine Invest., iv). According to Lamarck, this name is equivalent to *æquilatera* Gmelin ; mers d'Amérique ? (Lamarck).

Macrocallista florida (Lamarck).

Cytherea florida Lam., An. s. Vert., v, p. 565, July, 1818.

HAB.—Durban (McClelland) ; Red Sea, E. Africa to Mozambique, Madagascar (Römer) ; Seychelles (Martens).

Tivela dunkeri (Römer).

Venus (Cytherea) dunkeri Römer, Monogr. Molluskeng. Venus, i, p. 5, pl. v, f. 1, June, 1864.

HAB.—Port Shepstone (Burnup). Römer did not know the habitat of his species.

T. rejecta Smith.

Ann. Natal Mus., iii, pt. 1, pl. i, f. 11–13, September, 1914.

HAB.—South Africa (Smith) ; Durban (McClelland and Burnup).

Mactra intuspecta Deshayes.

P.Z.S. Lond., 1854, p. 64, January 10, 1855.

HAB.—Durban (Burnup, *vide* Lamy in J. de C., lxiii, p. 229) ; Seychelles, Madagascar, Comoro Isles and E. Africa (Lamy) : Manila (Coll. Cuming).

These specimens were originally determined as *intuspicta* Desh. by Smith.

M. rochebrunei Lamy.

J. de C., lxiii, p. 215, 30 November, 1917.

HAB.—Natal (Burnup, *fide* Lamy).

Loripes burnupi Smith.

Ann. Natal Mus., iii, pt. 1, p. 5, pl. i, f. 14–16, September, 1914.

HAB.—Port Shepstone (Burnup).



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2.

J. D. DEAN *del.*

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

515th Meeting, held at the Manchester Museum, December 6th, 1922.

Mr. G. C. Spence in the chair.

New Member Elected.

Henry Charles Higgins.

Candidates Proposed for Membership.

Edward Francis Wesley, 2 Arthur Street, New Oxford Street, London, W.C. 2 (introduced by J. R. le B. Tomlin and E. R. Sykes).

Giles Owen, 54, Townfield Lane, Barnton, Northwich, Cheshire.

Leonard B. Jump, B.Sc., The Gables, Winnington, Cheshire (both introduced by B. R. Lucas and J. W. Jackson).

Member Deceased.

Williams Evans.

Papers Read.

"*Vertigo alpestris* and *V. pusilla* in Merioneth," by C. Oldham.

"*Pisidium tenuilineatum* and *P. torquatum* in Shropshire," by C. Oldham.

"*Acanthinula lamellata* var. *albida* in Ireland," by R. A. Phillips.

"Notes on British Mollusca," by Alan Gardiner.

"*Paludestrina jenkinsi* in Fife and Forfarshire," by E. Crapper.

"Mollusca from the Belgian Congo," by G. C. Spence.

"Note on *Venus affinis* Sowerby," by J. R. le B. Tomlin.

"On South African Marine Mollusca, with Descriptions of several New Species," by J. R. le B. Tomlin.

Principal Exhibits.

By Mr. C. Oldham: Specimens to illustrate his two papers; also *Acicula lineata*, (1) Hastor, Tring, Herts, (2) Aston Clinton, Bucks; *Limnæa glabra*, Breidden Hill, Montgomeryshire; *Sphærium pallidum* and *Pisidium torquatum* from Shropshire Union Canal, Ellesmere, Salop; *Pisidium lilljeborgi*, from Llyn Llyn y Caws, Berwyn Mountains, Denbighshire; *Pisidium supinum* and *P. torquatum*, from Oxford Canal, Hillmorton, Rugby, Warwickshire.

By Mr. R. Standen: *Cypræa hungerfordi* Sow., and var. *kiiensis* Roberts from Kii Coast, Japan; *C. rashleighana* var. *transpiciens* Taylor and var. *eunota* Taylor, from Hawaii; and *C. stolidia* var. *crossei* Marie, from New Caledonia.

By Rev. L. W. Grensted: *Aplecta hypnorum* and *Planorbis leucostoma* from Withington, Manchester.

By Mr. B. R. Lucas: *Cypræa scotti* Brod. from Bussillon, W. Australia, and large form of same from Esperance, W. A.; *C. thersites* Gray from Edithburgh, S. Australia; *C. umbilicata* Sow., from Eden, N.S.W.; *C. decipiens* Smith from Broome, W.A.; *Voluta irvinii* from Carnac Isl., W.A.; *V. mamilla* Gray from off Eden, N.S.W.; *V. roadnightæ* McCoy from Australian Bight.

By Mr. G. C. Spence: Shells from the Belgian Congo to illustrate his paper.

516th Meeting, held at the Manchester Museum, January 3rd, 1923.

Mr. G. C. Spence in the chair.

New Members Elected.

E. F. Wesley.

Leonard B. Jump.

Giles Owen.

Candidates Proposed for Membership.

Capt. Lewis Richard William Loyd, F.Z.S., M.B.O.U., "The Look-Out," Branscombe, Beer S.O., Devon.

Charles Joseph Braun, 16a, Warrington Crescent, Maida Vale, London, W. 9 (both introduced by A. E. Boycott and G. C. Spence).

Hans Lohmander, Stenbocksgatan 4, Lund, Sweden (introduced by Berthold Sundler and J. R. le B. Tomlin).

Dr. B. Prashad, Zoological Survey of India, Indian Museum, Calcutta (introduced by J. R. le B. Tomlin and A. E. Salisbury).

Resignation.

E. C. Stump.

Principal Exhibits.

By Mr. G. C. Spence :—*Blanfordia simplex*, *B. japonica* and *B. bensoni* from Japan; *Streptaxis elongatus* and *Gonaxis vengoensis*, from Macequece Dist., Portuguese East Africa; also various species of *Plectopylis*.

By Mr. R. Standen :—*Isidora dybowskii* and *Planorbis boissyi*, from Cairo (both carriers of Bilharzia); also *Pustularia* group of *Cypræa*.

By Mrs. Gill :—*Mitra bretteinghami*, *M. bovei*, and other species of the genus.

By Mr. A. T. Hopwood :—*Brechites pulchrum*, Singapore and *Ephippodonta mcdougalli*, from S. Australia.

By Mr. E. Crapper :—*Limnæa pereger* from Fifeshire localities, showing variation.

By Mr. J. W. Jackson :—*Clausilia laminata* with large denticle on outer lip, from cave-earth, Harboro' Cave, near Brassington, Derbyshire.

517th Meeting, held at the Manchester Museum, February 7th, 1923.
Mr. G. C. Spence in the chair.

New Members Elected.

Capt. L. R. W. Loyd. C. J. Braun. Hans Lohmander. Dr. B. Prashad.

Candidates Proposed for Membership.

Rev. Stanley Graham Brade-Birks, M.Sc., 16, Bank Street, Darwen, Lancashire (introduced by J. W. Jackson and L. W. Grensted).

Señor José Giner Mari, Pellicers 2 pral, Valencia, Spain (introduced by J. R. le B. Tomlin and N. G. Hadden).

The Rev. Emrys Lloyd Rowlands, B.D., 38, Florence Street, Newcastle, Staffs. (introduced by J. W. Jackson and R. Standen).

George A. Martin, Sherwood, Newport Road, Cardiff (introduced by J. Davy Dean and G. C. Spence).

J. N. Millott, Hill Crest, Carter Lane, Mansfield (introduced by R. Bulley and W. Gyngell).

Resignations.

Bertha M. Challis.

F. J. Ede.

Papers Read.

"Additions to the Mollusca of Somerset," by N. G. Hadden.

"Observations on the Land Mollusca of the Coasts bordering on the Bristol Channel," by J. Davy Dean.

"Ueber L. Pfeiffer's englische Stücke von *Helix gigaxii*," by Dr. F. Haas.

Principal Exhibits.

By Mr. J. Davy Dean : Specimens to illustrate his paper.

By Mr. B. R. Lucas : *Xylophaga* (shells and animals) taken out of Jarrah piles in Bunbury Harbour, W. Australia, 1921.

By the Rev. L. W. Grensted : Fine examples of *L. pereger* var. *ovata* from the New River, Cheshunt, Herts.

The Special Exhibit was British Solens.

518th Meeting, held at the Manchester Museum, March 7th, 1923.

Mr. G. C. Spence in the chair.

New Members Elected.

Rev. Stanley Graham Brade-Birks, José Giner Mari, Rev. E. L. Rowlands, G. A. Martin, J. N. Millott.

Candidate Proposed for Membership.

Lady Davy, Churchfield, West Byfleet, Surrey (introduced by N. G. Hadden and J. R. le B. Tomlin).

Resignations.

H. J. Stalley.

C. E. Wright.

Members Struck off the List (Rule iv).

G. Abbott, H. Mückardt, A. M. Oliver, R. S. Smallman, W. C. Smith, F. Stanley and S. Wheatcroft.

Paper Read.

"Two New Varieties of *Limax cinereo-niger*," by Fridthjof Ökland.

The Special Exhibit was British *Succinea*.

519th Meeting, held at the Manchester Museum, April 7th, 1923.

Mr. G. C. Spence in the chair.

New Member Elected.

Lady Davy.

Candidate Proposed for Membership.

Clifford Horton-Smith, Woodvale, Bramhall, Cheshire (introduced by J. Wilfrid Jackson and R. Standen).

Papers Read.

"*Vitrina marcida* Gould," by Prof. T. D. A. Cockerell.

"*Zonitoides excavatus* in Dumfries-shire," by E. Crapper.

Exhibits.

By Mr. R. Standen : *Separatista chemnitzii* A. Ad., from Japan, and *S. grayii* A. Ad., from Charbar ; *L. palustris* var. *corvus*, recent and fossil, from Ilford ; *Cypræa tigris* vars. *hinnula*, *flavonitens*, *chionia* and *ionthodes*.

The Special Exhibit was British Freshwater Operculates.

520th Meeting, held at the Manchester Museum, May 5th, 1923.

Mr. G. C. Spence in the chair.

New Member Elected.

C. Horton-Smith.

Candidates Proposed for Membership.

Fridthjof Ökland, Majorstriveien 15, Kristiania, Norway (introduced by Professor G. O. Sars and O. Nordgård).

Ralph W. Jackson, Cambridge, Maryland, U.S.A. (introduced by C. W. Johnson and Dr. H. A. Pilsbry).

Papers Read.

"List of a small collection of shells, mainly from Salonika ; with description of a new *Anodonta*," by J. R. le B. Tomlin, M.A.

"On a new species of *Ochthephila* from Porto Santo Island," by A. C. Noronha.

"On cutting sections of Mollusca for the Microscope," by Dr. E. W. Howell.

Principal Exhibits.

By Mr. E. R. Brown : Colour forms of *Oliva erythrostoma* L.

By Mr. Giles Owen : *Hygromia hispida* and var. *albida*, *Succinea elegans*, *Vitrea cellaria*, *V. nitidula*, and *V. rogersi* from Barnton, Northwich.

By Mr. R. Standen : *Ampullaria ampullacea* L. and *Melania* (*Sermyla*) *brookei* Rve. from Patalung, Malay States ; *Limnæa involuta* from Cromaglaum (coll. J. R. Hardy, 1866) ; *L. pereger* var. *candida* from Brinnington Marsh, Northwich (1912).

The Special Exhibit was *Pseudotrochus* (= *Perideris*).



Large Cochlicella barbara in Sussex.—In a paper on *Cochlicella barbara* in Sussex, which I read to our local Nat. Hist. Soc. last winter, I recorded two specimens from Saddlescombe, near Brighton, each 24mm. in length. Last week Mr. P. Arnold, of Brighton, brought in a shell of 26mm. But I still hold the record, for on Sunday last I visited Saddlescombe and secured a shell of 26.75mm. in length. This year the snails are more numerous than I have ever seen them.—H. S. TOMS. (*Read before the Society*, Nov. 1st, 1922).



Helix hortensis and H. nemoralis living in company.—Whilst at Ilfracombe in September last I paid a visit to Hele, a small village on the sea coast and there found, on the cliff top amongst damp herbage, a large colony of *H. hortensis*. Whilst collecting specimens I discovered a few *nemoralis*, the two species living actually in the same colony. One of the *H. nemoralis* had a rough extension beyond the lip similar to, but smaller, than those found on specimens from Bundoran. There is no sand in the vicinity, the colony being on the edge of a field, but the main road runs close by and the large amount of motor traffic along this covers the herbage with dust, and this dust apparently has the same effect upon the mollusca as blown sand has at Bundoran. Of the two, *H. hortensis* is the predominant form in the district, *H. nemoralis* being found sparsely distributed and in the case under notice representing only about ten per cent.—A. K. LAWSON. (*Read before the Society*, November 1st, 1922).

OBSERVATIONS ON THE LAND MOLLUSCA OF THE COASTS BORDERING ON THE BRISTOL CHANNEL.

BY J. DAVY DEAN, F.E.S.

(Read before the Society, February 7th, 1923).

THERE are several distinctive features in the conchology of the coast of South Wales, and I have thought therefore that a record of some of my observations would be of general interest. Also, whilst there are many molluscan associations which are common to both sides of the Channel, there are some species, requiring particular types of habitat, which appear only on the Welsh side, or only on the English side of the Channel.

From Cardiff to Tenby is roughly a matter of a hundred miles. To travel from east to west is to pass the westerly limit of *Theba cantiana*, *Helicigona lapicida*, *Clausilia laminata* and *Pomatias elegans*, which are found only in Monmouthshire and Glamorgan, north of the Channel. The reason is largely physical, governed as it must be by geological conditions. Cardiff, be it noted, is a city with one foot in Monmouthshire. Passing the low-lying coast between Chepstow and Newport with the almost monotonous mud-flats and old red sandstone, we come to Penarth Head, the first of the lias cliffs, with the characteristic horizontal strata which is such a feature of the Glamorgan coast. West of the village of Rhoose the coast changes again, becoming a series of low-lying headlands or marshy flats till the Ogmore is reached. Beyond this river sand-dunes make their first appearance, rising, at Merthyr Mawr to a height of 100 feet. Conchologically these great dunes are poor, and except for the large and rather weathered *Helix nemoralis* which occur there, have less individuality than might be expected. But on the Newton dunes a little further west there is an abundant fauna, including our most local species *H. pisana*. Beyond Porthcawl are the Kenfig dunes, but again very few snails, and though some of the grassy hollows swarm with *H. nemoralis* the colonies are hard to find, or once found to find again. Sand-dunes occur again at Port Talbot, Swansea and on the short Carmarthenshire coast beyond Llanelly, but I have not yet had an opportunity of working these, nor have I yet seen the Swansea locality, which had for so long been the only known habitat in Glamorgan for *H. pisana*. In Pembrokeshire there are two patches of sand-dune coast, one at Saundersfoot and the other at Tenby, and with these exceptions the coast is rocky, exposed, and as we proceed further westward, open to the full force of the Atlantic gales.

Somerset boasts of a number of bays with picturesque headlands which act as a natural screen for the prevailing southerly winds.

With a milder climate, vegetation is more luxuriant. At Minehead, for instance, the shore is lined with a screen of Tamarisk; walnuts and figs are to be had for the picking, yet above and beyond are the heather and whinberry-covered hills of wind-swept Dartmoor. Between Minehead and Ilfracombe is some of the most magnificent coast scenery to be seen in Great Britain. Mountain and sea meet in a most wonderful precipice till Lynton is reached, famous for its colony of albino *Helicigona lapicida*. Immediately west of Lynton the coast is Cornish in type and interesting as a habitat of *Hygromia revelata*. Lundy Island is in type similar to this part of Devon, and in its fauna, a part of it.

Perhaps the most striking feature in the molluscan fauna of the Channel is the wonderful abundance, in any suitable locality, of *Hyalinia lucida*, Drap. and an extraordinary scarcity of *H. cellaria*. Whether *lucida* was introduced at Bristol or not, it is certainly at the present day one of our commonest shells. It turns up everywhere in similar situations to *cellaria*, in hedgerows, among rocks, under stones in quarries, in garden and outhouse, often crawling quite openly. Other equally common species are *Pyramidula rotundata*, *Hygromia striolata* and *Helix hortensis*, the general associates of a *lucida* habitat.

In South Wales there is a general tendency in snails, as in insects, towards melanism. Dark forms of *Helix aspersa*, *nemoralis* and *hortensis* predominate. Brown forms of *Helicella virgata* and *caperata* may be passed over for *Hygromiæ*. The darkest *nemoralis* I have seen come from the hills above Cærlleon, in Monmouthshire, the darkest *hortensis* from the mainland opposite Sully Island in Glamorganshire; the darkest *aspersa* from St. Nicholas, the highest point on the road between Cardiff and Cowbridge.

Albinism, pure or partial, crops up locally. *Helix hortensis*, in the form known as *arenicola*, in which the band pigment is absent, occurs abundantly all over Monmouthshire and Glamorgan. *H. aspersa* var. *exalbida* is frequent along the same coast. White examples of *Theba cantiana* often outnumber the type. Albinos of *Pyramidula rotundata* are local but will reward a search, as the species grow to a large size, larger than I have seen elsewhere. Specimens of *Zonitoides excavatus* are all referable to the var. *vitrina* Menke.

Other than melanic and albino varieties, there are a number of phases in the colouring of *H. nemoralis* and *hortensis* which are not confined to one locality and which may therefore be described as characteristic. In *nemoralis* red forms, nearly always banded, predominate. The var. *castanea* ooooo is general almost everywhere on the Welsh side, but not on the opposite coast. A very characteristic form is *rubella* ooo(45); in *libellula* rare. Sometimes this character

has superimposed the white peripheral band—var. *fascialba* Taylor : thus there are the three distinct zones of colour ; red spire and upper body whorl, a white band and chocolate base. At Cærleon the var. *castanea* f 123(45) is very common, but should be seen alive as the colour is a fugitive one. I have taken the var. *roseozonata* 12345 here, also the var. *citrinozonata* in Glamorgan, but these shells are rare. Thus, while *hortensis* tends towards unpigmented bands, *nemoralis* does not, and while in *nemoralis* red forms predominate, the var. *incarnata* of *hortensis* is absent. The var. *lutea* is common with the type and *arenicola*, but it is rather in the manner in which bands coalesce that variation occurs. The only exception is the frequency of the form 10345, more especially in *hortensis*.

Helicigona arbustorum is generally dark and richly mottled, reaching the largest size in Monmouthshire. The var. *fuscescens* is rare and I have never collected *flavescens*, although it is recorded. High spired forms approaching *conoidea* are frequent in both Monmouthshire and Glamorgan. The species is recorded for Hoyle's Mouth, near Tenby, but I have not seen examples. I have not seen the species on the English side of the Channel.

The finest *Helix pisana* are to be found at Porthcawl in Glamorgan. The shells are lighter in colour than the general Tenby form, with an absence of the arrow-shaped flecking ; the narrow continuous lines grouped in four zones in their composite character give us a shell much nearer the continental type and referable to the var. *lineata*. Variation in the form of the shell is considerable from *depressa* to *subconica* Monts. The colony near Swansea is restricted to a small area and all the shells I have seen approach the *minor* form. At Saundersfoot in Pembrokeshire the var. *menkeana* Moq. is as frequent as the type, and a genuine var. *minor* diam. 12 mm. may be looked for. The Tenby shells are well known, few collections being without examples. A characteristic here, as distinct from any other in South Wales, is the large and varied area over which the snails swarm.

The distribution of *Helicella* is of interest. Records of *heripensis* Mab. are incomplete, the only one being Sully in Glamorgan ; the habitat a very restricted one. *H. virgata* and *caperata* are common, but the former does not reach any size. Both vary, the vars. *leucozona* Taylor. and *fulva* Moq. respectively being common with the type. Albinos of *virgata* are nearly always small. *H. itala* is very isolated, in its colonies, from the other species, but is large in size with little or no variation other than the absence of the banding—a rarity on the Welsh coast. This species is never, in my experience, found with or near *pisana*. *Helicella caperata* is the most general of the Welsh species and *itala* the most local. *H. acuta* used to be found at

Penarth, but the biggest colony in Glamorgan is the *pisana* habitat at Porthcawl, these two species being again in the closest association in Pembrokeshire. The red sandstone of Monmouthshire seems to be unfavourable to *Helicella*. In this county the ring-fence of the carboniferous limestone, surrounding the coal-measures, swerves far inland and only touches the Channel again at Chepstow, conchologically a part of the Wye valley, and beyond the province under consideration. Minehead, the artist's centre in Somerset, is also red sandstone, and again there are no *Helicellæ*, but from this side of the Channel my records are very few and incomplete.

I have never found *Hygromia fusca* to be at all common. Perhaps a single specimen will turn up and all endeavours to find others seem to be fruitless. At other localities four or five specimens are the only reward of a close search. Bacchus' dark variety at Bristol is unique and I have not found a similar form down Channel. *Hygromia granulata* used to be taken at Cardiff but seems to have disappeared. It occurs at Swansea and Oxwich Marsh and is plentiful in Pembrokeshire. Plants and grasses on the dunes, which are covered with *pisana*, will be found swarming with *granulata* at their roots. In this sense the two species are associates, though not as a fixed rule.

Pupa secale is very abundant at Weston-super-Mare and on the Steepholm in association with *Pomatias elegans*, *Helicigona lapicida*, *Ena obscura*, etc. But, although the lias cliffs of Glamorgan simply swarm with *Pomatias*, *Pupa secale* is missing, nor does it occur to my knowledge anywhere on the Welsh coast.

Helicigona lapicida is common, but local on both sides of the Channel, and in the lias district is to be found lurking under the flat slabs of rock. I have even found it at the bottom of a hedge !

Balea is more common here than *Clausilia*, though neither are abundant, and of the two species of *Clausilia*, *bidentata* is general and *laminata* local, with the albino of both rare. There are four *Vertigines*, *edentula*, *pygmæa* and *antivertigo* generally distributed, although local, along both coasts, with the addition of *substriata* on the Welsh side. It is among these smaller species that fresh records may be looked for.

AN ATTEMPT TO PAIR A DEXTRAL WITH A SINISTRAL LIMNÆA PEREGER.

BY LIONEL E. ADAMS.

(Read before the Society, November 1st, 1922).

THE pairing of sinistral with dextral individuals of land species seems to be extremely difficult, if not impossible.¹ But water species, which can suspend themselves in any position, might be expected to achieve the desired result. The following notes, though inconclusive, suggest the possibility of success. J. A. Hargreaves² and W. H. Hutton³ both state that they have seen this take place in a pond, but without close examination a futile attempt might be easily mistaken for consummation. On Feb. 20th, 1922, I placed a virgin sinistral *L. pereger*, born in the summer of 1921, with a dextral individual of similar size and age in a glass jar of two quarts capacity, with a supply of *Elodea*. Though watched daily nothing happened till May 6, when D tried to copulate with S which was passive. On the following dates attempts were made to copulate; May 6, 8, 9, 10, 15, 17, 19, 20, 21, 23, 26; June 7, 15, 18, 19; July 4, 11, 13; August 9, 10.

These attempts were very persistent and often continued throughout the entire day. The movements of the pair were easy to follow with a large reading lens, but, though I watched them daily, often for hours together, their attempts, till July 11, were evidently fruitless. They crawled over each other in turn and twisted about with penes extended but could not find the right position for penetration. Of course, it is impossible to say if they had any greater success when I did not happen to be watching.

However, on July 11 I observed that the pair had succeeded in adopting themselves to each other's formation—that is to say that one had placed its extended penis on the genital pore of the other—but I am uncertain if actual penetration was effected, nor was this action mutual, though during the afternoon I noticed that each in turn had assumed this possibly successful position. This was the only occasion on which I noticed the possibility of success.

Between June 6 and August 15 about twenty capsules of eggs were laid amongst the weed or loose in the bottom of the jar, most of the latter being infertile. Many, if not most of the batches observed in detail contained infertile eggs.

¹ *cf. J. of C.*, vol. vii, p. 33, and *J. of C.*, vol. xi, p. 34.

² *J. of C.*, vol. xvi, p. 55.

³ *Ibid.*, p. 58.

The batches tabulated below were laid against the side of the glass jar, or were removed from the weed and isolated within an hour or two of being laid, and could thus be dealt with in detail. Of course it was impossible to do more than guess to which parent each batch belonged.

No. of eggs in batch.	Laid.	Hatched.	† Incubation.	Results.
1, 2, 3	June 6	June 11	5 days	6 D
21	July 13	July 31—Aug. 1	18-19 „	17 D
10	„ 25	Aug. 5	11-12 „	10 D
11	„ 30	„ 18	17 „	*
10	Aug. 1	„ 18	16 „	*
30	„ 8	„ 27	19 „	*
35	„ 15	„ 31	16 „	*

The following batches found amongst the weed and isolated give the following results. The date of their being laid was unknown:—

S. 4, 17, 4, 5 = 30.

D. 1, 2, 3, 17, 10, 21, 7, 5 = 66.

D × S. (10 D + 5 S), (1 D + 6 S). = 11 D + 11 S.

The above with numerous single young ones found about the jar amount to the total for the season of 152 D, 48 S.

It is perhaps useless to speculate as to which parent laid any particular batch; probably most if not all were self-fertilised, but the two mixed batches indicate the possibility of a successful copulation.

† The variation in duration of incubation is probably due to the great variation of temperature.

* I was unable to see these all hatch out, so I cannot particularize the issue.

Pisidium tenuilineatum and P. torquatum in Shropshire.—A small gathering of *Pisidia* which I made in the Shropshire Union Canal, at Weston Rhyn, near Chirk, in June, 1922, comprised *subtruncatum*, *henslowanum*, *nitidum*, half-a-dozen *tenuilineatum*, and three or four *torquatum*. In the following October I took about a dozen *torquatum* in the canal at Ellesmere. Our knowledge of the distribution of these two tiny molluscs, which should be sought for in rivers and canals, is still very meagre, but the deficiency would surely be remedied if only collectors would use scoops of fine wire gauze. A mesh of twenty to the linear inch retains even young examples and yet sifts the mud effectively.—CHAS. OLDHAM. (*Read before the Society, December 6th, 1922*).

NOTES ON BRITISH MOLLUSCA.

By ALAN GARDINER, B.Sc.

(Read before the Society, December 6th, 1922).

Epitonium commutatum (Monterosato).—While inspecting a number of shells of *E. clathrus* (Linné), collected by me about a mile from the mouth of the Helford River, Cornwall, several years ago, Mr. R. Winckworth detected a single specimen of *E. commutatum* (Monts.). This shell is not recorded in Tregelles' list, "The Marine Testaceous Mollusca of Cornwall." Jeffreys mentions that it was found at Porthcurnow Cove by the late Miss Lavers of Penzance.

Paludestrina jenkinsi (Smith).—This species occurs in thousands in the College Water at Bradfield, Berks. To have reached this spot the animal must have made its way either up the weir or through the mill, or have been carried by water birds. This is an interesting instance of the rapid progress this species is making in its penetration of our inland waters. A tank in the Science Buildings filled with river water was found the next day to have a band of this snail quite an inch wide at the water level. This will give some idea of the vast numbers in which it occurs.

Anodonta cygnea (Linné).—In the lake at Englefield, Berks., I took a specimen of this species of which the following are the measurements:— $7\frac{7}{10}$ " by $3\frac{4}{5}$ ", girth 11". The animal must have been a very old one; the weight of the shell was no less than 148 grammes, or about 4·6 ounces.

Vitrina major Fér.—This species has been in my collection for many years quite unsuspected. Mr. Winckworth detected it mixed with *Vitrina pellucida* (Müller), which had been collected at Falmouth and at Burnham-on-Sea.

Cardium papillosum Poli.—Mr. Tomlin found this rare shell amongst a number of the genus which I collected at Falmouth in the hope of finding it. Cornwall has many records of this species, but none, I think, in recent years up to now.

Nuculana minuta (Müller).—I found a single specimen of this shell on the beach at Milford-on-Sea, Hants. This is at the west entrance to the Solent. It was an example of what I understood to be the typical form, and was found with many other small species in a tangle of old cotton, hydrozoa, string, etc., which had formed an efficient drag.

Nassa pygmæa Lamarck.—This species was found in vast numbers in lobster pots off Chideock, Dorset. There were a few *Nassa incrassata* (Ström), typical, and var. *simulans* Jeffreys with them.

Phytia denticulata (Montagu).—A white form of this species occurs under very large stones in running water at Key Haven, near Lymington, Hants. It seems distinct in colour and texture of shell and almost worthy of varietal rank. It was found only in the above kind of situation; those near, which were associated with *Paludestrina ulvæ* (Pennant), were normal.

Neolepton obliquatum Monts.—“Lord Brandon 1886 cruise. Log 33. $51^{\circ}22\frac{1}{2}$ N, $7^{\circ}58'$ W, $52\frac{1}{2}$ fathoms.” A shell bearing this label has come into my possession and was exhibited at the annual meeting.

Zonitoides excavatus in Dumfriesshire.—According to the June, 1921, edition of the Census, the Dumfriesshire record for *Z. excavatus* has so far only been provisionally accepted, and requires confirmation. I am, therefore, glad to be in a position now to confirm its occurrence in this county, as on 21st Sept. 1921 I gathered a single specimen of this shell at Langholm, a small town situated in the extreme east of Dumfriesshire. The shell referred to has been seen by Mr. Oldham and Prof. Boycott, and will be added to the Voucher collection.—E. CRAPPER. (Read before the Society, April 7th, 1923).

Anodonta anatina new to Perthshire Mid.—While scrutinizing some *Anodonta cygnea* which I gathered in Dupplin Loch, on 24/4/20, a particular shell included therewith, noticeably smaller in size and different in shape, proved, on closer examination, to be *Anodonta anatina*. On referring to the Census I found that this mollusc has not yet been recorded for any of the three Perthshire Vice-Counties. I have, therefore, pleasure in recording this shell for Vice-County 88. The shell referred to will be included in the Voucher collection.—E. CRAPPER. (Read before the Society, Nov. 1st, 1922).

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WANTED in exchange, South American mollusca of all kinds, marine and terrestrial—J. R. LE B. TOMLIN, 23, Boscobel Road, St. Leonards-on-Sea.

WANTED—To purchase new or used (unmarked) copy of Sowerby & Fulton's "Catalogue of Cephalopoda, Pteropoda, Gastropoda," etc., issued in March, 1911. Write me if you have a copy to spare.—HENRY C. HIGGINS, Keyport, N. J., U.S.A.

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No. 3.

DREDGING IN LOCH ALSH.

BY H. C. WINCKWORTH AND R. WINCKWORTH.

(Read before the Society, November 7th, 1923).

OUR original plan for a summer holiday was to work the low tides at Oban, and to move on to Loch Fyne for dredging, but we eventually decided to explore new ground and spend the whole week at Kyle Akin in Skye. The dredging proved exceptionally interesting, but the shore work was disappointing ; this was partly owing to the absence of suitable ground for collecting, and partly to the weather, for heavy showers on two of the best days very much hindered our seeing and collecting during the limited time of low water. Between us we explored some ten miles of coast between Broadford and Kyle Rhea, but our shore list numbered but 31 species, of which we need only mention, *Buccinum undatum* L. var. *littoralis* King, abundant at Kyle Rhea ; a fine living *Velutina velutina* (Müller) in the same locality, and the shell of *Chlamys nivea* (Macgillivray) on the south side of Loch na Beiste.

Out of seven days in Skye, we dredged on five in a roomy lugger, with auxiliary motor, belonging to skipper McLean, whose skill and knowledge were most valuable to us. We had 30 hauls in all in Loch Alsh and Loch Duich, in depths varying from 7 to 60 fathoms. This last shot (between 58 and 61 by the chart) is the deepest we have attempted, but in the sheltered waters of Loch Duich, free from any swell, dredging becomes a comparatively easy operation. Most drags lasted about half an hour, drifting usually without sail or petrol, or with a little help when wind and tide were insufficient. The haul was at once emptied into a fish box, so that the dredge was ready to be shot again immediately. The catch was then washed through a fine sieve with sea water and stowed in holland bags for further examination.

Most of our material was either shell and stone in 12 to 30 fathoms, or thick slimy mud from 40 fathoms and more. This sticky mud took a lot of sieving, but eventually washed down to a small residue very rich in mollusca. Altogether we dredged 101 species. I do not

propose to list them all here, but to enumerate the principal species found together in different kinds of ground, the result of a careful tabulation of all living species from each haul. Naturally the dredge will often take several kinds of ground in one drag, but when sufficient lists are tabulated it is an interesting puzzle to disentangle the results, and to see for instance that one haul in 20 to 30 fathoms, mainly grit, must have included a small patch of mud with quite a different association of species, that another haul on almost the same ground has just missed the mud patch but includes a few examples of species associated with a gravel bank near by. We hope to get better results in this line by using a conical dredge next year; this has been found by experiments at Plymouth to give collecting results very similar to those of a grab, but obviously no quantitative work can be based on it.

The two most widely distributed species were *Calliostoma clelandi* (Wood) (= *millegranus* Ph.) and *Trichotropis borealis* Brod. and Sow., which turned up dead or alive in almost every haul. *Æquipecten opercularis* (L.) was common on many grounds and shewed considerable variation of form, from a large race, some 80 mm. or over 3 inches in length, somewhat eccentric and much longer than deep, to a smaller race whose depth distinctly exceeded their length (v. *elongata* Jeffreys); all were very strongly sculptured. From a collector's point of view, the rarest find was *Eulimella ventricosa* (Forbes).

Broken shell and mud, 10-20 fm., Loch na Beiste :—

<i>Nucula nucleus</i> (L.),	<i>Calliostoma clelandi</i> (W. Wood),
<i>Æquipecten opercularis</i> (L.),	<i>Turritella communis</i> Lam.,
<i>Myrtea spinifera</i> (Mont.),	<i>Trichotropis borealis</i> Brod. & Sow.,
<i>Corbula gibba</i> (Olivi),	and dead <i>Aporrhais</i> .

The same association occurred in muddy grit, 20 fm. Loch Alsh, except that *Nucula nitida* (Sow.) replaced *N. nucleus* and there was no trace of *Aporrhais pespelicani*.

Broken shell and decaying laminaria fronds, 12-15 fm., off Castle Moyle : in all these hauls *Echinus esculentus* L. was plentiful :—

<i>Lepidopleurus asellus</i> (Gm.),	<i>Gibbula cineraria</i> (L.),
<i>Monia squama</i> (Gm.),	<i>Calliostoma conuloides</i> (Lam.),
<i>Æquipecten opercularis</i> (L.),	<i>Calliostoma clelandi</i> (W. Wood),
<i>Chlamys distorta</i> (da C.),	<i>Trichotropis borealis</i> Brod. & Sow.,
<i>Syndosmya alba</i> (W. Wood),	<i>Buccinum undatum</i> L.
<i>Tectura virginea</i> (Müller),	

In one haul *Velutina velutina* (Müller) occurred with the above.

Shell and stone, 25-30 fm. Loch Alsh and 15 fm., Loch Duich :—

<i>Lepidopleurus asellus</i> (Gm.),	<i>Saxicava arctica</i> (L.),
<i>Æquipecten opercularis</i> (L.),	<i>Emarginula fissura</i> (L.),

<i>Palliolum tigrinum</i> (Müller),	<i>Calliostoma clelandi</i> (Wood),
<i>Palliolum striatum</i> (Müller),	<i>Trichotropis borealis</i> Brod. & Sow.,
<i>Astarte sulcata</i> (da Costa),	<i>Buccinum undatum</i> L., slender,
<i>Astarte montagui</i> (Dillwyn),	<i>Nassarius incrassatus</i> (Ström).

In these hauls the Ophiuroid *Ophiopholis aculeata* (L.) was in great evidence; brachiopods, both *Crania* and *Terebratulina*, always present, especially in Loch Duich. In one Loch Alsh haul a single *Chiton albus* was found; in another *Arca tetragona* Poli, *Modiolus modiolus* (L.), *Musculus marmoratus* (Forbes) and dead *Lepeta fulva* (Müller).

Grit, sometimes very muddy, 15-30 fm., Loch Alsh:—

<i>Æquipecten opercularis</i> (L.),	<i>Timoclea ovata</i> (Penn.),
<i>Pseudamusium simile</i> (Laskey),	<i>Cardium fasciatum</i> Mont.,
<i>Astarte sulcata</i> (de Costa),	<i>Gari tellinella</i> (Lam.),
<i>Dosinia exoleta</i> (L.),	<i>Saxicava arctica</i> (L.).
<i>Dosinia lincta</i> (Pult.),	

In one haul *Pandora pinna* (Mont.) was present. No echinoderms.

Thick mud, 40 fm. and more, Loch Alsh; 40-60 fm., Loch Duich:—

<i>Nucula sulcata</i> Bronn,	<i>Syndosmya nitida</i> (Müller),
<i>Yoldiella tenuis</i> (Phil. non Mont.),	<i>Montacuta bidentata</i> (Mont.),
<i>Limatula gwyni</i> (Sykes),	<i>Corbula gibba</i> (Olivi),
<i>Myrtea spinifera</i> (Mont.),	<i>Dentalium entalis</i> L.,
<i>Thyasira flexuosa</i> (Mont.),	<i>Pyrgostelis fulvocincta</i> (Thompson),
<i>Axinulus ferruginosus</i> (Forbes),	<i>Turritella communis</i> (Lam.).

Shells of *Alvania abyssicola* (Forbes) and fragments of *Thracia convexa* (Wood) occurred in all hauls. *Syndosmya longicallus* (Scacchi) occurred in Loch Alsh hauls only and *Nucula tenuis* (Mont.) only in Loch Duich. The Loch Duich mud from 60 fm. was marked by the abundance of the starfish *Amphiura filiformis* (Müller). Another interesting starfish was the cladophiuran *Astronyx loveni* (Sars) from about 40 fm. in Loch Duich. Valves of *Cuspidaria cuspidata* (Olivi) and *C. abbreviata* (Forbes) occurred, but no living specimens.



Pholadidea loscombiana (Goodall).—I obtained two specimens of this species at Chideock, one in 1923 and the other in 1920. On each occasion these single specimens were associated with great numbers of *Pholas dactylus* (Linné), *Barnea parva* (Pennant) and fewer *Barnea candida* (Linné). On neither occasion was there any evidence of the occurrence of *loscombiana* in a colony of its own species.—
ALAN GARDINER.

LIST OF A SMALL COLLECTION MAINLY FROM SALONIKA,
with Description of a New ANODONTA.

BY J. R. LE B. TOMLIN, M.A.

(Read before the Society, May 5th, 1923).

A SMALL collection of land and freshwater shells, mainly from the country round Salonika, has been placed in my hands by Capt. J. Waterston for examination, and though the number of species is not large, yet a record of material from so little known a region is bound to be of interest, especially as it contains an *Anodonta* which differs—as far as I have been able to ascertain—from any described form or species.

Capt. Waterston was at Itea for a few days in December, 1917, and in the following April. The three species thence were collected at the foot of the outcrop of the local limestone. Lakes Ardzan and Amatovo were frequently visited in the autumn of 1917.

Helicella crenulata Müller.—Itea, on the Gulf of Corinth.

Helix lucorum L.—Lahana.

Ena microtragus Rossm.—Itea. A characteristic species of the Balkan peninsula.

Clausilia pikermiana Roth.—With the last. This species is particularly abundant round Corinth.

Acroloxus lacustris L.—Lake Amatovo, frequent on reeds. Common throughout the palæarctic area.

Limnæa palustris Müller.—Lake Amatovo.

L. stagnalis L.—Lakes Amatovo and Ardzan. Both these *Limnæas* are universal in the palæarctic area.

Planorbis carinatus Müller.—

P. (Coretus) corneus L.—

P. (Gyraulus) albus Müller.—Lahana. These three species

are also universally distributed.

Bithinia leachii Shepp.—Lake Amatovo. Distributed all over Europe.

Dreissena polymorpha Pallas.—Lake Ardzan.

Unio tumidus Retz.—Lake Beschik. Many examples of this wide-spread species, of quite ordinary form.

Anodonta waterstoni nov. sp.—Shell rather ventricose, subquadrate; more or less irregularly concentrically ribbed with lines of growth which become stronger towards the ventral margin; covered with a fairly glossy greenish brown periostracum; umbones extremely flattened; ligament strong and conspicuous, occupying nearly half the dorsal margin which is generally slightly arched; ventral margin sloping very strongly upwards towards the anterior side into which

it is imperceptibly merged in an even curve; posterior side quite straight or sometimes slightly concave; the angle between this side and the ventral margin being decidedly and rostrately produced; interior bluish white, with some pale salmon colouring in the umbonal region; anterior muscle scars small but plainly excavate, posterior scars large but less distinct.

Long. max. of type specimen, 58 mm.

Lat., 65 mm.; diam. max. 28 mm.

Hab., Lake Beschik, where it occurred in myriads; many had evidently been eaten by waterfowl.

Type in British Museum.

Dr. Haas, of the Senckenberg Museum in Frankfort-on-Main, tells me that according to Bourguignat's ideas this shell would be assigned to the genus *Colletopterum*, and that it is nearly related to *Coll. plattenicum* Serv. from the Balaton Lake.



LIMNÆA BURNETTI Alder IN LOCH SKENE.

By E. CRAPPER.

(Read before the Society, November 2nd, 1921).

IN September of 1921, I spent a short holiday in Langholm, Dumfries-shire, but was rather dismayed to discover that it would be a stiff task to reach Loch Skene from there. The shortest route by road was 43 miles, and the railway was not at all helpful. I, however, ultimately decided to cycle, and did so on 30th September.

The journey was uneventful, except that much of the road proved to be rough and hilly, so that it was late in the day before I reached the Loch. The last 10 miles from Moffat, where the road follows upwards the course of the Moffat Water, were grand, one massive hill giving place to another. Ettrick Pen (2,269 feet) on right and Hart Fell (2,651 feet) on the left were, among others, passed. When I at last reached the point on the main road opposite to where I had been told the Loch lay, I discovered that although I was already 1,000 feet up, I should have to climb approximately another 700. The ascent is remarkably steep, and great care in negotiating the very treacherous pathway is essential. Loch Skene proved to be a typical Highland Loch, about a quarter of a mile long and 2 to 300 yards across. It is surrounded on three sides by precipitous crags, and presents a picture of ruggedness and desolation difficult to describe.

For securing the *Limnæa* I found a pond scoop of no use, the bottom of the Loch being almost entirely composed of large round boulders which prevented its use. I also found that to lift out and examine the stones and boulders methodically did not produce much, besides which their size did not encourage such manipulation. *L. burnetti* was, however, sparingly distributed on these boulders, and experience soon taught me that the most satisfactory method was to lie full length and gaze intently into the water until I could spot a *burnetti* reposing on a stone. The recurring ripple on the surface of the water caused by the wind was a great hindrance to this method, and I felt that a water-telescope, similar to those used by the pearl fishers on the Tay, would have been very useful. Although I only succeeded in getting 12 specimens, I should not say that this shell is scarce, but rather that it is fairly plentiful, though difficult to secure on account of the natural conditions.

Probably the best centre from which to work Loch Skene would be Moffat. A ten mile road journey therefrom brings one to the vicinity.

ADDITIONS TO THE MOLLUSCA OF SOMERSET.

By NORMAN G. HADDEN.

(Read before the Society, February 7th, 1923).

MR. E. W. SWANTON published his excellent "Mollusca of Somerset" (Som. Arch. and Nat. Hist. Soc.) in 1912, in which he recorded 108 species of non-marine molluscs and about 80 marine species. As Mr. Swanton had done little collecting in West Somerset, only a few records of localities for the less common species are given for this part of the county. West Somerset cannot by any means be called a rich collecting ground for mollusca, as the soil is markedly deficient in lime and large areas are covered with heather, whortleberry and similar calcifuge plants. The almost total absence of large ponds and slow-flowing streams is equally unfavourable for freshwater species. Whilst the innumerable ditches (rhines) on the peat-moor district of Mid-Somerset form ideal haunts for aquatic molluscs, one looks in vain for the larger univalves and *Unionidæ* in the swift-flowing shallow streams which rise on Exmoor or the Quantock Hills in the west. In the following list of additions to Mr. Swanton's list, I have included the few records which have appeared in the "Journal of Conchology" since 1912. All my own records refer to the Porlock and Minehead district in the extreme west of the county.

As regards the Marine section my records deal only with Porlock Bay. At first sight the Bay looks about as unfavourable for shells as could well be, but it is much more prolific than it appears to be. The beach consists of large stones with very few rock pools and no stretches of sand. It is enclosed on the east by the fine headland of Hurlstone Point and on the west by Gore Point a little beyond Porlock Weir; the distance between the two points being about three miles. Off both the points there is a great zone of *Laminaria* (known locally as "Cow-tail Weed") uncovered at low tides and a most interesting collecting ground. The fauna of the two points is probably very similar, but I have visited Gore Point much more frequently as it happens to be of easier access. As is the case all along the Bristol Channel the tide recedes to a great distance, so that a very wide expanse of shore is exposed at low tide. The great majority of the species are to be found alive; dead shells very soon become broken up on the stony beach.

ADDITIONS TO THE MOLLUSCA OF SOMERSET.

Testacella maugei Fér. var. ***viridans*** Mor.—One near Porlock Weir, May, 1917. (J.C., vol. xv, p. 288).

Limax cinereo-niger Wolf.—Not uncommon in woods about Porlock, Horner and Oare.

L. maximus L. var. **fasciata** Moq.-Tan.—¹Failand, N. Somerset. (Miss Agnes Fry).

Limax flavus L.—Apparently very scarce. Two specimens (one adult and one immature) under pots in garden at West Porlock, Dec., 1922.

Limax arborum B. Chant var. **pallens** Less.—Porlock, Nov., 1918. The typical form is abundant throughout West Somerset.

Agriolimax lævis Müll.—Frequent in wet places; Porlock and Minehead Warren.

Milax sowerbyi Fer.—One of the most destructive pests in gardens about Porlock.

M. gagates Drap.—Less plentiful than *M. sowerbyi* and occurs more in allotment gardens and fields than in enclosed gardens.

Vitrina pellucida Müll.—Plentiful in the winter months about Porlock, Selworthy and Minehead.

Vitrea crystallina Müll.—Plentiful throughout West Somerset. I found it paired on Feb. 17th, 1917, the first mild day after prolonged frost.

V. lucida Drap.—A small colony about a ruined shed at Bossington close to the sea. They were probably imported with lime some years ago and seem to be dying out.

V. cellaria Müll. var. **albina** Moq.-Tan.—Occurs occasionally with the type in the Porlock district.

V. alliaria Miller var. **viridula** Jeff.—Porlock and Selworthy, with the type which is very abundant.

V. radiatula Alder.—Not common; Porlock, Horner and Minehead Warren.

Zonitoides nitidus Müll.—Scarce. Marsh below Dunster.

Z. excavatus Bean.—Type and var. *vitrina* Fér. occur in about equal numbers in the Porlock district. It is not usually gregarious, but on Oct. 1st, 1920, I found nine specimens (all v. *vitrina*) feeding on old cow dung near Dunster Castle.

Arion ater L. var. **brunnea** Roebuck.—Porlock.

Var. **plumbea** Roebuck.—Porlock.

Var. **albo-lateralis** Roebuck.—A specimen of this striking variety was sent me by Mr. C. J. Pring from Priddy Nine Barrows, N. Somerset.

A. subfuscus Drap. var. **cinereo-fusca** Drap.—Plentiful in gardens and orchards at Porlock.

Punctum pygmæum Drap.—Porlock and Culbone Woods and Minehead Warren. Not plentiful.

Sphyradium edentulum Drap.—Porlock, Horner and Culbone.

Pyramidula rotundata Müll. var. **turtoni** Fleming.—West Porlock, 7/1920.

Var. **pyramidalis** Jeff.—Porlock, 9/1918.

Var. **rufula** Moq.-Tan.—Porlock, 4/1916.

Var. **alba** Moq.-Tan.—Rather frequent in West Somerset. Porlock, Culbone, Horner and Winsford Hill.

Helicella virgata Da Costa.—Fairly plentiful on arable land in Porlock Vale, but most of the shells are small.

Var. **lineata** Olivi.—Abundant on short grass near the sea at Bossington.

Var. **maculata** Moq.-Tan.—Porlock, 8/1916.

H. caperata Mont. var. **subscalaris** Jeff.—Bossington, 12/1918.

Var. **ornata** Picard.—Not common; Porlock Weir and Minehead Warren.

Var. **fulva** Moq.-Tan.—A fine colony of very dark shells on Minehead Warren. Occasionally occurs also at Bossington.

Hygromia fusca Mont.—Occurs in woods throughout West Somerset, but is not abundant. It is fairly often to be found among *Luzula maxima* in Culbone Woods and Badgworthy Valley.

H. granulata Alder.—A colony in a wet copse Minehead on Warren. I have never seen it in the Porlock district.

H. hispida L. var. **depilata** Alder.—A small colony of this variety in garden at West Porlock; also Culbone Woods.

Var. **albida** Jeff.—One in garden at West Porlock, Feb., 1920.

H. striolata Pfeiffer var. **depressa** Taylor.—Porlock Weir.

Acanthinula aculeata Müll.—Porlock and Horner Woods, but not plentiful.

Vallonia costata Müll.—Minehead Warren.

V. excentrica Sterhi.—Minehead Warren and Horner.

Helicigona lapicida L.—The typical form is scarce in the Porlock Woods and along the cliffs east of Porlock Bay.

Var. **minor** Moq.-Tan.—This very interesting and distinct variety occurs fairly plentifully among stones on the inland side of the great pebble ridge which marks high-tide line on the shore below Porlock. Many of the shells are only 11 millimetres in diameter when mature. Normal *lapicida* is never found with the variety.

Var. **explanata** Loc.—Some of the shells in the colony of var. *minor* are so remarkably flattened as well as dwarfed that they may well be referred to this variety.

H. arbustorum L.—Scarce in West Somerset, I have taken one or two specimens in Horner Woods, Culbone Woods and North Hill, Minehead.

Helix aspersa Müller var. **conoidea** Pic.—Porlock, April, 1916.

Var. **nigrescens** Moq.-Tan.—Occasionally about Porlock.

Var. **flammea** Pic.—West Porlock and Bossington.

Var. **albo-fasciata** Jeff.—Minehead Warren.

Var. **exalbida** Menke.—One in a larch wood at West Porlock, Sept. 1917.

H. nemoralis L. var. **rubella** Moq.-Tan.—Common about Porlock.

Var. **libellula** Risso.—Equally common.

Var. **fasciata** Pic.—Frequent about Porlock.

Var. **castanea** Pic.—I have only once seen this in West Somerset, at Malmsmead, close to the Devon border, ¹Brislington (D. Bacchus).

H. hortensis Müll. var. **minor** Moq.-Ton.—Porlock, April, 1916.

Var. **trochoidea** Clessin.—Minehead Warren, May, 1918.

Ena obscura Müll.—Scarce in West Somerset in Oakwoods.

Cæcilioides acicula Müll.—Porlock Rectory garden (living, Aug., 1917). Porlock Weir (living, April, 1918). Dead shells in rejectamenta of River Horner at Bossington.

Pupilla muscorum L.—Plentiful in Minehead Warren, under overhanging tufts of grass on walls, etc.

Balea perversa L.—Rather frequent on walnut trunks about Porlock and Horner.

Succinea elegans Risso.—Ditches on Minehead Warren. Occasionally in ditch on Porlock Marsh.

Carychium minimum Müll.—Fairly plentiful throughout W. Somerset.

Phytia myosotis Drap.—Porlock Weir, very scarce.

Ovatella bidentata Mont.—Porlock Weir, very scarce.

Ancylus fluviatilis Müll.—Type (sometimes very large) and var. **albida** Jeff. are abundant in the river Lyn and its tributaries on Exmoor. It also occurs in small stony streams flowing through woods about Porlock, where the shells are usually very thin.

¹ J. C., vol. xvi, p. 155.

Limnæa pereger Müll var. ***ovata*** Drap.—Ditches at Bossington.

Var. ***maritima*** Jeff.—In a small ditch on Porlock Marsh, in 1918; since an exceptionally high tide penetrated to this ditch I have seen no trace of the molluscs.

Var. ***boissyi*** Dupuy.—Specimens collected in the upper reaches of the R. Lyn (Oare Water, Badgworthy, Weir Water, and Chalk Water) are referred to this variety by Mr. J. W. Taylor. Many of the shells in these moorland streams are very much eroded and thin shelled, probably owing to deficiency of lime.

Limnæa truncatula Müll.—Porlock marsh, uncommon.

Planorbis corneus L.—Curry Moor (C. J. Pring).

P. umbilicatus Müll.—Curry Moor (C. J. Pring).

P. vortex L.—Minehead Warren, below Dunster.

P. spirorbis L.—Minehead Warren and Porlock Marsh.

P. fontanus Lightfoot.—Ditch on Minehead Warren.

Paludestrina ventrosa Mont.—Porlock Weir, very scarce.

P. stagnalis Bast.—Porlock Weir, very scarce.

P. jenkinsi Smith.—¹Clevedon (D. Bacchus).

Acicula lineata Drap.—Two dead shells in rejectamenta of River Horner, at Bossington, Jan., 1920.

Sphærium lacustre Müll.—Ditch on Minehead Warren.

Pisidium.—No *Pisidium* apparently occurs in the Porlock and Exmoor streams, nor are any dead shells to be found in the rejectamenta of the Horner River.

MARINE MOLLUSCA (PORLOCK BAY).

Nucula nucleus L.—Single valves abundant in Porlock Bay; living specimens occasionally found at very low tide.

Anomia ehippium L.—Immature specimens common in Porlock Bay.

Mytilus edulis L.—Abundant all round the Bay.

Modiola barbata L.—A fine living specimen below West Porlock, June, 1917.

Modiolaria discors L.—At roots of *Laminaria*, Gore Point.

Ostrea edulis L.—Occasionally found living at low tides.

Pecten varius L.—Scarce; alive in small rock pools. Odd valves constantly washed ashore.

Kellia suborbicularis Mont.—Alive at Gore Point; rare.

Scrobicularia plana Da Costa.—Sub-fossil shells are abundant at Porlock Weir, but apparently it no longer lives in the Bay.

¹ J. C., xvi, p. 262.

Tellina tenuis Da Costa.—Dead shells only.

Macoma balthica L.—Only an occasional valve washed up.

Spisula solida L.—Scarce in the living state ; dead shells rather frequent.

Cardium edule L.—Dead shells washed up frequently.

Sphenia binghami Turton.—Alive at Gore Point, March, 1918.

Saxicava rugosa L.—Rather frequent all round the Bay.

S. arctica L.—Occasionally found alive at Gore Point.

Pholas dactylus L.—Scarce in the 'Submarine Forest' at Porlock Weir.

Barnea candida L.—Plentiful in the 'Submarine Forest.'

Teredo megotara Hanley.—Frequent in logs washed ashore and in old piles at Porlock Weir.

Chiton cinereus L.—Frequent under stones all round the Bay.

C. ruber Lowe.—Rather frequent at Gore Point and elsewhere.

C. lævis Mont.—Scarce at Gore Point and below Porlock.

C. fascicularis L.—Not uncommon round the Bay.

Patella vulgata L.—Abundant, but no marked varieties.

Helcion pellucidum L.—At roots of *Laminaria*, Gore Point. The immature shells are plentiful on the fronds of the *Laminaria*.

Acmæa virginea Müll.—Scarce at Gore Point.

Emarginula fissura L.—Gore Point ; alive, uncommon.

Fissurella græca L.—Gore Point ; occasionally found alive.

Gibbula cineraria L.—Plentiful all round the Bay.

G. umbilicata Mont.—Plentiful all round the Bay.

Monodonta crassa Montfort.—Several large colonies round the Bay.

Calliostoma zizyphinus L.—Alive at Gore Point and Hurlstone Point.

Var. **lyonsi** Leach.—Occurs occasionally with the type.

Phasianella pullus L.—Living in Corallines, occasional all round the Bay. Always rather small shells.

Lacuna parva Da Costa.—Living at Gore Point, scarce.

L. divaricata Fab.—Living among *Laminaria* at Gore Point.

L. pallidula Da Costa.—Living with the last species.

Littorina obtusata L.—Abundant on *Fucus*.

L. rudis Maton.—Abundant on stones. A dwarf form occurs in abundance on the rocks below Culbone about high-tide line ; it resembles *L. neritoides* ; but I have never found this species on the Porlock coast.

L. littorea L.—Abundant, sometimes very large.

Rissoa parva Da Costa.—On small weeds in the rock pools.

Onoba striata Adams.—Scarce, in rock pools.

Trivia europæa Mont.—Dead shells frequent ; occasionally living at Gore Point at extreme low tides.

Buccinum undatum L.—Very fine live specimens can be found at low tide at Gore Point.

Ocenebra erinacea L.—Not infrequently alive at Gore Point.

Purpura lapillus L.—Abundant. There are one or two colonies of extremely large shells below Porlock.

Nassa reticulata L.—Living at Gore Point.

N. incrassata Ström.—Living at Gore Point.

Clathurella linearis Mont.—Once taken at Porlock Weir alive.

Octopus vulgaris Lam.—A small one found alive at Gore Point, Aug., 1920.



Modiolus gallicus (Dautzenberg).—This species was described in the *Feuille des Jeunes Naturalistes*, 1895, p. 97, and well figured, but seems to have escaped observation in England or to have been confused with other species. It comes nearest in outline to *M. ovalis* Sowerby and in general appearance to the young of *M. modiolus* (L.). A British record has already been published in the Monaco report on Northern Mollusca (*Camp. Sci. Monaco* xxxvii, 1911, p. 388) viz.: 44 fathoms off Orkney. This year I obtained it attached to wild oysters trawled off Brighton. It is probably not uncommon in our waters, and likely to turn up if watched for. It is much more delicate than *M. modiolus* and the barbules finer and more agglutinative ; this latter feature is quite striking in living examples.—R. WINCKWORTH.



Planorbis stroemii (Westerlund).—I obtained one fresh example of this shell in the Thames below Goring this year ; its identity has kindly been verified by Mr. Kennard. So far as I know, apart from Pleistocene records, it has only been recorded from Gosford Bridge in this country, and is supposed to be associated with *Chara*.—R. WINCKWORTH.



Osilinus lineatus (da Costa).—This species is very common under the Golden Cap at Chideock. This station is the extreme eastern one on the south coast for this species, just as Studland is for *Calliostoma exasperatum* Penn.—ALAN GARDINER.

EDITORIAL NOTES.

We commend the following letter to members who may be in a position to help :—

BRITISH MUSEUM (NATURAL HISTORY),
CROMWELL ROAD,
LONDON, S.W.7.

“ Dear Sir,

Mr. O. W. Richards, of Brasenose College, Oxford, is engaged upon an ecological and genetic study of *Helicella caperata* and *gigaxii*. He is anxious to obtain *living* material from a good many localities with details of soil on which the animal is found, associated plants and other bionomic data. He would be very grateful if any member of the Conchological Society would forward him such material, and would refund postage.

If any member is willing to help Mr. Richards the writer would be very much obliged.

Specimens should be sent to Mr. Richards, c/o Department of Comparative Anatomy, The Museum, Oxford.

Believe me,

Yours very truly,

G. C. ROBSON.

The Editor, Journ. of Conchology,
23, Boscobel Road, St. Leonards-on-Sea.”

We gather from the Belfast News-letter of Wednesday, July 11th last, that at the summer graduation ceremony, held the previous day in connection with Queen's University, Belfast, the degree of M.Sc. (honoris causa) was conferred on our President-elect, Mr. Robert J. Welch. We congratulate him very heartily in the name of the Society. The presentation was made by Prof. Gregg Wilson, in the following terms :—

“ I have the honour of presenting to you for the degree of Master of Science (honoris causa) Mr. Robert J. Welch, M.R.I.A., president-elect of the Conchological Society of Great Britain, and one of the editors of the “Irish Naturalist.” Mr. Welch has many claims for such an honour. He has contributed largely to the advancement of our knowledge of archæology, geology, botany and zoology. He is an acknowledged master in the domain of scientific photography, and his name is known all over the world in connection with the illustration of natural phenomena. He has taken a prominent part in several biological surveys, and in particular in the exhaustive exploration of Lambay Island and Clare Island, undertaken by the Fauna and Flora Committee of the Royal Irish Academy. He has published valuable natural history papers—chiefly on Land and Fresh Water Mollusca—in “The Irish Naturalist,” “The Journal of Conchology,” “The Proceedings of the Royal Irish Academy,” and “The Proceedings of the Belfast Naturalists' Field Club.” But perhaps even more remarkable than the influence he has exerted by his publications has been the stimulus he has given by his enthusiasm to those whom he has personally guided in the pursuit of scientific knowledge. He has inspired with his own zeal many surveying parties of workers from our own neighbourhood and from England and elsewhere; and he has helped to make famous the best collecting grounds of Ulster. He has been unsparing in his efforts to train the young naturalists of Belfast, so that the cherished reputation of our city for field work may be maintained. No naturalist was ever more unselfish in his work. As an example of his generosity I may mention that he has to his credit the fact that he has

collected and presented to the museums of Great Britain and Ireland approximately one million shells. For all these reasons I have pleasure in asking you to confer the degree of Master of Science."

In "Some Notes on the Hinge of the Sphæriidae" (*Nautilus*, xxxv, pp. 104 to 117), Dr. V. Sterki discusses the primitive formation of the hinges in the early nepionic stage of the molluscs, the subsequent changes to maturity, and variation in its relation to classification and the standing of species. He criticises the views of P. Pelseneer and B. B. Woodward on the development of the hinge-teeth in the growing shell, urging that they do not arise by fission, but that although they undergo considerable changes during growth they originate independently of one another. The author, whilst insisting on the value of the hinge as a factor in distinguishing species, especially in *Pisidium*, points out that other characters may have as great a value, that in some species the hinges are indistinguishable, whilst in others they are quite peculiar, and that on the other hand some species exhibit features irrespective of the hinge that are just as characteristic and recognizable.

C.O.

A new Guide has recently appeared to the Mollusca in the Natural History Museum, prepared by Mr. G. C. Robson.

Though based on the old Guide, it has been entirely rewritten and augmented with much new and up-to-date matter. Thus allusion is made to the very recently discovered phenomenon of parthenogenesis in *Paludetrina jenkinsi*, and to the capture of live *Spirula* in large numbers by the Danish Oceanographical Expedition last year.

The Guide is illustrated with 47 excellent figures, and very clearly set up, misprints being few. We note *Ostræa* and *Ostræidae* (p. 40), *Cythera* (p. 53), and *Entochonchidae* (p. 27).

On p. 24 we should prefer to see *Pomatiidae* for *Cyclostomatidae* and *Turris* for *Pleurotoma* on p. 30.

We welcome a handbook where the malacological side is so clearly and succinctly dealt with.

In the *Annals and Magazine of Natural History*, Feb., 1923, is a paper on the "Animal Ecology of King's College Chapel, Cambridge," by Messrs. Hobson and Matthews. Only one species of mollusca occurred: in the space between the inner and outer roofs of the Chapel they found one living and one dead *Helix arbustorum*.

We learn from New Zealand that Suter's collection has now found a final resting place in the Wanganui Museum.

The following quotations, translated from a letter recently received from Mr. A. C. Noronha, seem worth transcribing. Mr. Noronha has visited the Selvagens Islands (which are uninhabited) several times, and has stayed on them three weeks at a stretch.

"I fancy that *Helix ustulata* (= *H. macandrewiana* Pfr.) is becoming scarcer and scarcer on the Selvagens owing to the diminution in rainfall of recent years. In Madeira and Porto Santo, where the rainfall is also decreasing, similar results may be found. For instance, if there are prolonged intervals of drought in winter, all the eggs of *Helix undata* dry up and die: this never used to happen formerly. Where are the immense numbers of *H. pisana* which one used to find on the vines in Porto Santo in August, and which Lowe talks about? It is true that they are now largely used as an ingredient of duck food, but the scarcity of rain seems to

me to be an important factor in accounting for their decrease. The plants in Great Selvagen Island are disappearing, as I know from personal experience, and several species which existed there 30 or 40 years ago are now extinct. Is not this due to the smaller amount of rain?

I did some dredging there [i.e. at the Selvagens] with my two companions but with small results, as we only had a 10-foot boat, and both wind and currents are strong. The dredge was one which Canon Norman gave me and it had seen service in the fjords of Norway."

A valuable addition to our knowledge of the distribution of oriental mollusca is given by Dr. C. H. Oostingh in his "Recent shells from Java, pt. i, Gastropoda." The collection on which it is based belongs to the Geological Museum of the Agricultural University at Wageningen in Holland. A glance at the map which accompanies this paper shows that the collection comes from all parts of Java and is quite representative. The importance of a thorough knowledge of the Javanese recent Mollusca is realised when one comes to study the rich Upper Tertiary fauna. An extensive synonymy with references is given throughout. Two or three of the generic names need revision: thus *Solarium* should give way to *Architectonica*, *Tritonidea* to *Polia* and the family *Pleurotomidæ* to *Turridæ*.

The Monthly Bulletin of the Dept. of Agriculture, State of California, for Jan.-Feb., 1923, has an article entitled, "Eradication of the White Snail (*Helix pisana*) at La Jolla, California."

As this Bulletin is not likely to come into many members' hands, we give a short epitome of the paper.

H. pisana was first noticed at La Jolla in 1914, though doubtless introduced some years before, and according to one theory had originally escaped "from among a collector's specimens." In 1919 its numbers attracted the attention of county and state officials and something was done to check them, but three years later "the snails had increased again to enormous numbers, had spread over twenty-two city blocks and were well established two-and-a-half miles north." They occurred not only on plants and shrubs, but "on houses, telephone poles, trees, under boards, in crevices about bridges and fences, under stones, among rocks and even under the floors of buildings," in all sizes up to $\frac{7}{8}$ inch in diameter. Apparently the centre of distribution was a rocky canyon running up from the sea through the lower part of the town. This canyon was first denuded of vegetation and then sprayed with a roaring flame that consumed everything in its path. Where this process was not feasible, hand-picking was the only way. *Pisana's* habit of sealing itself up during the dry season "precluded the use of stomach poisons or contact sprays" until the rainy season came. It was then found that *pisana* fed readily on a mash of calcium arsenate 1 part (by weight) to 16 parts of bran, and "in a garden plot 16 x 20 feet, which had over 6,000 snails, a kill of 96 % of all active snails was secured."

Since the beginning of the campaign (July 17th, 1922), two to ten men have been continuously at work, and for some weeks the road gang of ten men from the county jail was employed.

The writer remarks—"it cannot be said that the snails in any given area are eradicated as yet, the work has been progressing slowly but satisfactorily; slowly because the snails must be literally ferreted out of every nook and cranny."

There are photos showing the abundance of the snails, the damage they do and the actual shells; these, both in shape and colouration, look quite familiar.

NOTE ON THE VARIATION OF CLAUSILIA ITALA Martens.

BY W. E. ALKINS, M.Sc.

(Read before the Society, April 14th, 1920).

THROUGH the kindness of the late Mr. Edward Collier a series of *Clausilia itala* Martens, collected by him in 1889 at Bellagio, Lake Como, Italy, was made available to the writer for measurement. The variation in length, in width, and in the ratio $\frac{\text{Width}}{\text{Length}}$ and the correlation of width and length, have been studied in one hundred and eighty full-grown specimens.

The length was taken from the apex to the farthest extremity of the lip; the width was taken as the greatest diameter of the shell, perpendicular to the axis. Each was determined by means of an optician's sliding gauge provided with a vernier and capable of reading to one-tenth of a millimetre; the length was read to the nearest half-millimetre, the width to the nearest one-tenth of a millimetre. From the data obtained the value of the $\frac{\text{Width}}{\text{Length}}$ ratio was calculated, and a correlation table for length and width was drawn up. This correlation table is shewn in full in Table I, while Table II gives the $\frac{\text{Width}}{\text{Length}}$ ratio distribution data.

TABLE I. CORRELATION OF LENGTH AND WIDTH.

Length ; mm.	Width : mm.								Total.	Mean Width mm.	Stand- ard Devia- tion mm.	Coefft. of Varia- tion.
	3·5	3·6	3·7	3·8	3·9	4·0	4·1	4·2				
14				1					1	3·8		
14·5	1	2	4	1					8	3·66	·0857	2·34
15	1	4	15	8	6	5			39	3·77	·1275	3·38
15·5		3	7	15	12	8			45	3·83	·1133	2·96
16	1		9	12	3	4	5	1	35	3·85	·1593	4·14
16·5		3	4	11	4	6		1	29	3·83	·1396	3·64
17				2	7	5	3		17	3·95	·0915	2·32
17·5					3	1	1		5	3·96	·080	2·02
18						1			1	4·0		
Total	3	12	39	50	35	30	9	2	180	3·83	0·1421	3·71
Mean Length mm.	15·17	15·42	15·42	15·77	16·04	16·08	16·50	16·25	15·81	...	...	...
Standard Deviation mm.	·623	·702	·594	·636	·823	·634	·577	·25	·764	...	...	...
Coefficient of Variation.	4·11	4·55	3·85	4·03	5·13	3·94	3·50	1·64	4·83	...	...	...

TABLE II. $\frac{\text{WIDTH}}{\text{LENGTH}}$ Ratio.

Ratio $\frac{\text{Width}}{\text{Length}}$	0·22	·23	·24	·25	·26	·27
No. of Specimens	14	33	52	52	23	6
Mean Ratio	0·2431	...	...	...	...	...
Standard Deviation	0·01594	...	...	...	...	...
Coefficient of Variation	6·56	...	...	...	...	...

The frequency polygon shewing the distribution of length is given in Figure 1; the corresponding curve for width is given in Figure 2, while Figure 3 shews the distribution of the ratio $\frac{\text{width}}{\text{length}}$. Each curve is a fairly normal, somewhat asymmetrical distribution curve, and the species, therefore, appears to be perfectly homogeneous in respect of these three features. In none of the three is the variability high: the coefficients of variation (Pearson) are: for length, 4·83; for width, 3·71; and for the ratio, 6·56. The group of shells examined forms, therefore, a well-defined biological entity.

It was noticed at once, before any measurements were made, that the tumidity of the shells varied very considerably; one could easily pick out long slender forms and short tumid examples. It was, therefore, of interest to enquire whether there was any considerable correlation of length and width, i.e. whether a long shell was usually wide or usually narrow. It is clear at once from a glance at Table 1 that the correlation of the two dimensions is by no means precise; while there is some little tendency for shells of greater length to have greater width, it does not by any means follow that one can predict with any degree of accuracy the width of any shell, given the length. The correlation is so low that in the case of shells of 16 mm. length (i.e. near the mean length), the widths observed extend over the whole range of widths found in the complete series, the $\frac{\text{width}}{\text{length}}$ ratio likewise varying between its maximum and minimum values.

The coefficient of correlation of length (l) and (w) is + 0·395. The equations of regression are (all values in millimetres):—

(a) $w = 2·665 + 0·0735 l$;
with a standard error of $\pm 0·1305$;

(b) $l = 7·674 + 2·123 w$;
with the standard error $\pm 0·702$ (the correlation has

been investigated on the assumption that the regressions are linear).

Hence the tendency for a high width to be associated with a high length value is rather small.

In Figure 4 are shewn the mean length corresponding to each width (means of columns, Table I) and the mean width corresponding to each length (means of rows); the two straight lines are the lines of regression.

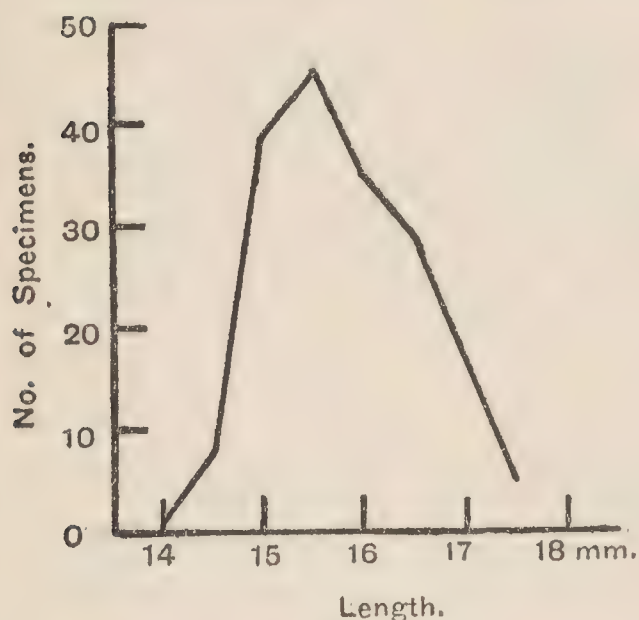


Fig. 1. Distribution of Length,

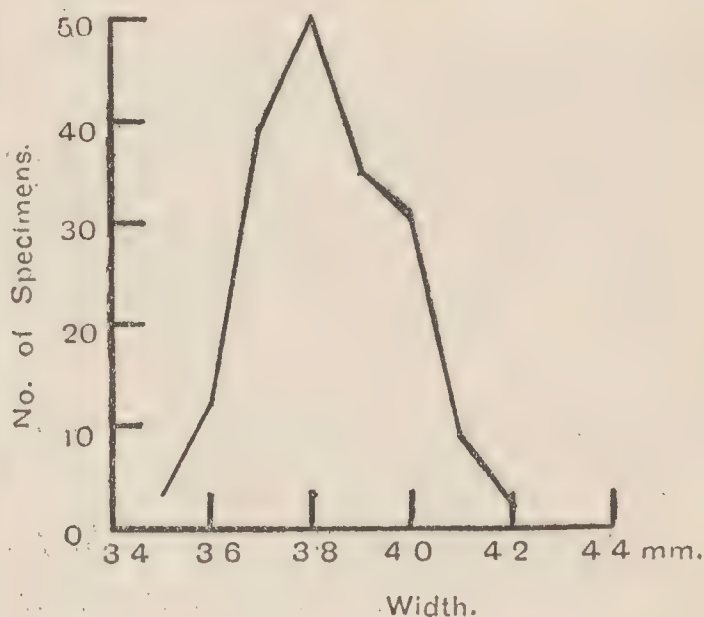


Fig. 2. Distribution of Width.

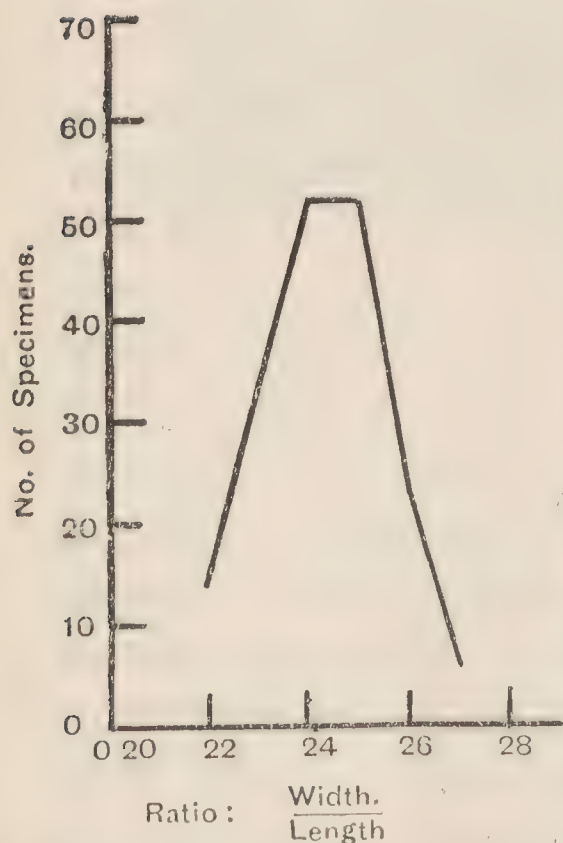


Fig. 3. Distribution of
Ratio: $\frac{\text{Width}}{\text{Length}}$

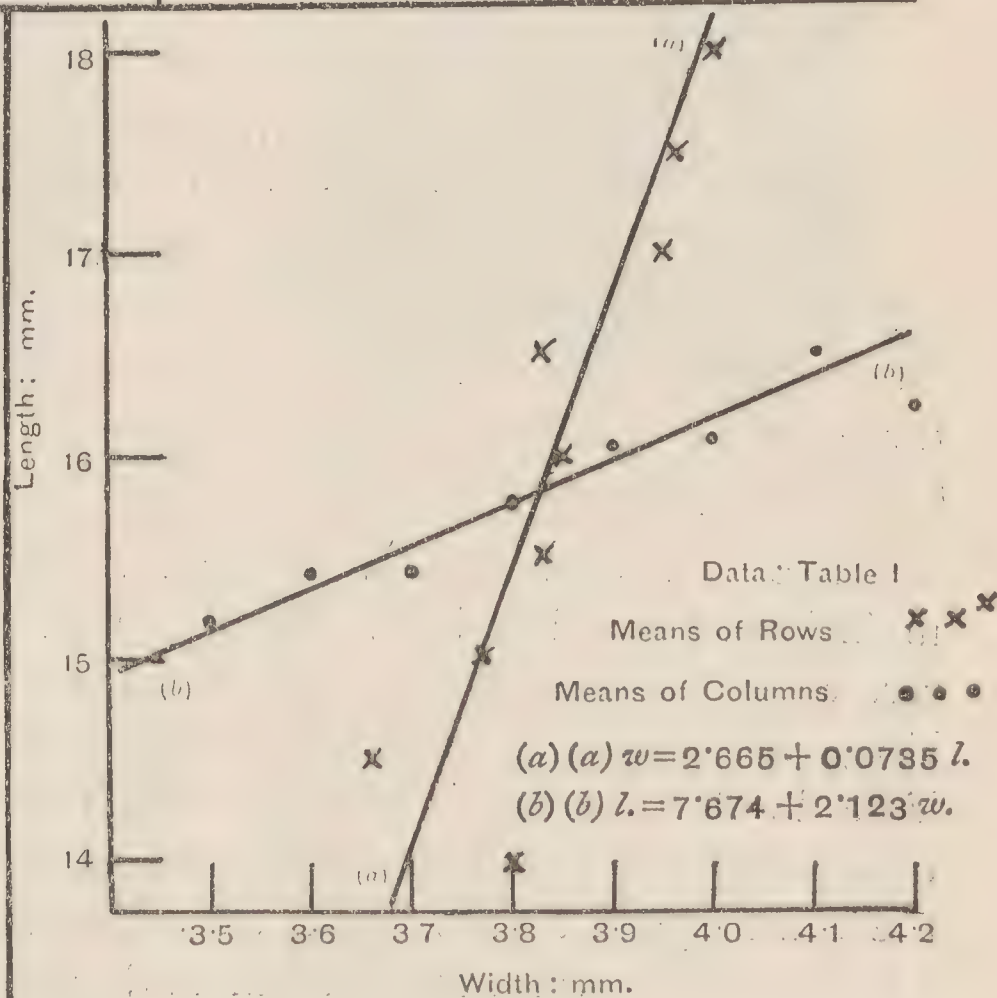


Fig. 4. Correlation of Length and Width.

SUMMARY.

This series of *Clausilia itala* Martens has been shewn to be perfectly homogeneous in respect to length, width, and the ratio $\frac{\text{width}}{\text{length}}$. The variability of each of these characters amongst adult specimens is low. The correlation of length and width is far from precise, the coefficient of correlation having a value of approximately $+\frac{2}{5}$.

A NEW SPECIES OF OCHTHEPHILA FROM PORTO SANTO.

By A. C. NORONHA.

(Read before the Society, May 5th, 1923).

PORTO SANTO, one of the Madeira Islands, is a place very well known to conchologists for its numerous endemic forms, and though many investigators have brought to light its highly interesting malacological fauna, there still remain a few species which hitherto have not been known. It is one of these specific forms we propose to deal with here.

Ochthephila cockerellii, nov. sp.

Testa umbilicata discoidea sen conuloideo-depressa, solidula, leviter striata et dense granulata; spira vix seu parum elevata, apice acutiuscula seu breviter rotundata; sutura impressa; anfractus 8 convexiusculi; ultimus sublimbato-carinatus, antice parum deflexus, basi convexus; umbilicus patulus, spiralis, infundibuliformis, anfractu penultimo fere clausus; apertura obliqua, elliptico-rotundata; peristoma simplex marginibus interruptis, callo junctis, supero recto, basali sinuato, ad umbilicum reflexiusculo.

Diam. maj. 19, min. 17, alt. 7-12 mm.

The present species evidently belongs to the subgenus *Tectula* established by Lowe for a small group of four species of which one, *O. lyelliana* (Lowe), is peculiar to the Desertas Islands, whilst the three others *O. albersii* (Lowe), *O. bulwerii* (Wood) and *O. tectiformis* (Sow.) are only to be met with at Porto Santo and its adjacent islets.

Like *O. albersii* and *O. bulwerii*, *O. cockerellii* is confined to the main island and has been found only in a subfossil condition, not rarely, by Mr. José J. de Sousa and myself in the earthen deposits along the seashore, to the eastward of the town, from Cabeço do Vale do Touro as far as Penedo and its vicinity. These deposits lie on a raised beach of pleistocenic origin, and they may be perhaps of the same epoch as the beach on which they rest. They are often formed of somewhat loose earth and broken pebbles, which came down from the hills above, and in this stuff many species of land-shells may be found embedded.

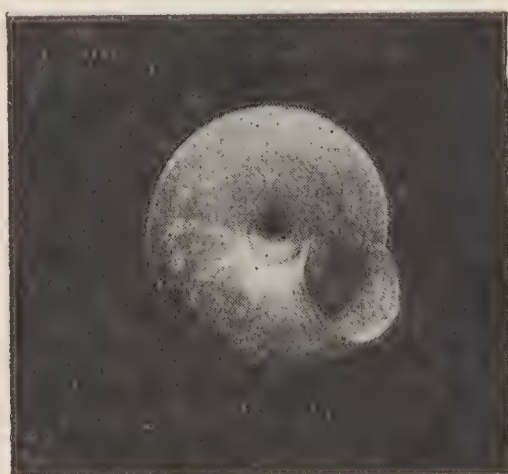
Apart from *O. tectiformis*, the other three species of *Tectula* have much in common with the present one.

The nearest ally of *O. cockerellii* is manifestly *O. albersii*, from which, however, it differs by its larger size, more open umbilicus and conspicuous granulations, especially at the base.

It is one of the largest members of the section *Tectula*, and it certainly displays two well separated varieties. One of these, which we consider as the normal state, is very depressed, thin, with very low conical spire, acute at the apex, the base rather round; the other, named here *inflata*, is much higher, more solid, with the spire slightly rounded, the whorls subgibbous, the apex rather obtuse and the base more convex.

Comparing these two states with *O. albersii*, the latter combines the not too much inflated base of the normal phasis with the somewhat arcuated spire of *inflata*, which is far from being dome-shaped as is the case with *O. bulwerii*. At the same time, the aperture, not very much deflected and slightly angulated in the middle, and the sharp keel not downwardly produced, are conspicuous features that the two varieties have in common with *O. albersii*.

Now, if we compare the actual species with *O. testudinalis* (Lowe), though the latter has been included by Lowe in the section *Discula*, we find some features common to the two species. They are of a



large and sensibly equal size, and have both an infundibuliform umbilicus, *O. testudinalis* combining always the depressed spire of *O. cockerellii normalis* with the tumid base of *inflata*. But the ultimate whorl of *O. testudinalis*, which is far from having a produced keel, its subpapillate apex, its recurved peristome, with a very thin lamina connecting the two margins, its faint granulations, certainly separate it specifically from the present form.

O. cockerellii was apparently adorned above with a narrow median fascia, whilst the under one was uni- or bi-fasciated, and many still show a shining appearance, particularly at the base.

Without venturing far into genealogical speculation, we may perhaps establish that *O. cockerellii* is, through its two phases, a sort of link between *O. testudinalis* on one side and *O. albersii* on the other, whilst the latter is again a link between *O. cockerellii* and *O. bulwerii*.

Some authors, as de Paiva and Wollaston, state that they have met with subfossilized examples of *O. testudinalis*, the former in a locality at the east of Porto Santo, and the latter in the south, at

Campo de Baixo. De Paiva says about that species: "Fossilis, carina exsertiore, ad Zimbral da Areia rarissima." Perchance would not the specimens of this locality be the true *O. cockerellii*, the appearance of this species leading him to take it for *O. testudinalis*? In the collection of the Funchal Seminary there are two specimens of *O. cockerellii* labelled as *O. testudinalis*, and this fact reinforces our suspicions that there has always been confusion about the two species, and that *O. testudinalis* must be, perhaps, considered as a quite recent one, localised in a restricted area, in the north of Porto Santo.

It has been said also that there are no intermediate forms between *O. albersii* and *O. bulwerii*, but we possess some examples in our collection that we do not know where to place. They were taken on the median slopes of Pico do Facho, above the trachitic ridge of Portelinha de Nossa Senhora, the only spots where the two species live mixed together, and to which *O. bulwerii*, at least well characterised, seems to be confined.

We have pleasure in naming this species after Prof. T. D. A. Cockerell, of Colorado University, to whose kindness we are very much indebted.



Montacuta bidentata (Montagu).—This animal is interesting from the variety of its habitats. It appears to be sometimes free living, and sometimes markedly commensal. The type locality is Salcombe, where Montagu describes it as burrowing in old oyster shells. It is certainly abundant there, and under the guidance of Dr. Orton, I have seen it in the burrows of *Nereis*, and also in the tubes of the Gephyrean *Phascolosoma* with *Lepton clarkiae* Clark: on the east side of Salcombe it is reported as commensal with the brittle star *Ophiocnida brachiata*. In Loch Alsh I found it associated with a similar starfish *Amphiura filiformis*. On the other hand I have found it living at low water at Stromness, ploughing its way through the sand, with *Akera nana* Jeffreys. At Glengariff I dredged it in company with *Akera bullata* Müller. At Brighton I once took it in the roots of *Corallina officinalis*. If it can live freely in the sand, why does it adopt so different a habit in the mud at Salcombe and elsewhere?—R. WINCKWORTH.

THE MARINE MOLLUSCA OF SÃO THOMÉ, III.

BY J. R. LE B. TOMLIN, M.A.

(Read before the Society, November 7th, 1923).

THE fourteenth volume of this Journal contains two papers with the above title in which Rev. L. J. Shackleford and I joined forces. They did not by any means exhaust the subject, but further work was postponed by the war and in 1917 Shackleford's untimely death and the loss of his enthusiastic collaboration resulted in the whole matter being shelved.

I am now able to offer a third paper of the series, dealing with the species that have been recorded from this island by other authors. The chief sources of this information are Nobre's *Matériaux*, etc. (1909), referred to in this Journal, vol. xiv, p. 239: Dautzenberg's ¹*Contribution à la Faune Malacologique de l'Afrique Occidentale* (1910): Hoyle's ²*List of Shells collected by John Rattray on the W. coast of Africa and the adjacent islands* (1887).

In the following catalogue only the species printed in heavy type are regarded as belonging with certainty to the S. Thomé fauna; those in italics are to be rejected either as erroneously identified or as recorded on insufficient evidence. I have not quoted Marrat's list in *J. C.*, vol. i, as no exact localities are given.

Sepia hierredda Rang.

Mag. de Zool., Moll., 1837, p. 75, pl. 100.

S. Thomé (Nobre); Goree (Rang); Atlantic and Algerian coasts of Africa, Tenerife, Cape (Tryon); Dakar (Dautzenberg); Madeira (Watson, in coll. Tomlin); Cape Colony, Natal, Lagos, Guinea coast, Sierra Leone (Brit. Mus. *fide* ³Smith).

S. ornata Rang.

l.c. p. 76, pl. 101.

S. Thomé (Nobre); W. coast of Africa (Tryon). Tryon puts this species into *Sepiella*.

Melampus liberianus H. & A. Adams.

P.Z.S., 1854, p. 12, 30 December, 1854.

S. Thomé and Principe (Nobre); Liberia (Mus. Cum. *fide* H. & A. Adams); Cameroons (d'Ailly).

Siphonaria capensis Q. & G.

Voy. Astrolabe, ii, p. 331, pl. xxv, f. 28, 29, 1832.

S. Thomé (Nobre); Cape (Quoy & Gaimard, Krauss, etc.); Loanda and Benguela (Dunker).

¹ *Actes Soc. Linn. Bordeaux*, lxiv, pp. 47—220.

² *Proc. R. Phys. Soc. of Edinburgh*, ix, 337—341.

³ *Pr. Malac. Soc.* xii, 20.

S. striatocostata Dunker.

Index Moll. Guin., p. 3, pl. i, f. 1—6, 1853.

S. Thomé (Nobre); Benguela (Dunker); Spanish Guinea (Hidalgo).

Bulla solida Gmel.

Syst. Nat., ed. xiii, p. 3434, 1791.

S. Thomé (Nobre and Hoyle incorrectly as *B. ampulla* L.); C. Verdes, Canaries, Conakry and W. Indies. If, as is probable, this is Menke's unfigured *B. perdicina*, we may add Guinea, Sierra Leone, Benguela and Loanda. It is *B. ampulla* Orb. non Linné.

Umbraculum mediterraneum (Lam.).

Umbrella mediterranea Lam., An. sans Vert., vi (i), p. 343, 1819.

S. Thomé (Nobre); Mediterranean and coast of Portugal; St. Helena? (Smith); C. Verdes ('Challenger').

Haminæa navicula (da Costa).

Bulla navicula daC. Brit. Conch., p. 28, pl. i, f. 10, 1778.

S. Thomé (Nobre); Atlantic from England to the Mediterranean.

Hydatina physis (L.).

Bulla physis L. Syst. Nat., ed. x, p. 727, 1758.

S. Thomé (Nobre); Rufisque (Dautzenberg); C. Verdes, Natal, W. Indies, E. Africa, Red Sea, Japan, Philippines, Botany and Moreton Bays, Hawaii.

Terebra senegalensis Lam.

An. sans Vert., vii, p. 287, 1822.

S. Thomé (Nobre); Senegal (Lamarck); Gambia, Los Is. and Mossamedes (Dautzenberg); Loanda (Hoyle); C. Verdes.

Conus genuanus L.

Syst. Nat., ed. x, p. 714, 1758.

S. Thomé and Loanda (Nobre); Goree and Rufisque (Dautz.); Annobon Is. (Dunker); Guinea; C. Verdes (Nobre).

Pusionella vulpina (Born).

Murex vulpinus Born, Index Mus. Caes. Vindob., p. 318, 1778.

S. Thomé (Nobre); Cape Rouge and Congo estuary (Dautz.).

Clavatula diadema (Kiener).

Pleurotoma diadema Kiener, Coq. Viv., p. 43, pl. viii, f. 2, 2a, 1839.

S. Thomé (Nobre); île du Prince (Kiener); Senegal and Los Is. (Dautz.).

C. pyramidata (Kiener).

Pleurotoma pyramidata Kiener, *l.c.* p. 57, pl. xxi, f. 4, 1839.

S. Thomé (Nobre); Senegal (Kiener); Whydah (Smith).

Marginella bifasciata Lam.

An. sans Vert., vii, p. 357, 1822.

S. Thomé and Principe (Nobre); Angola (Welwitsch); C. Blanco, Dakar, Baie de Hann et de Rufisque, Port Etienne, C. Rouge (Dautz.).

M. olivæformis Kiener.

Coq. Viv., p. 12, pl. viii, f. 36, 1834.

S. Thomé (Nobre); Goree and Baie de Rufisque (Dautz.).

M. miliaria (L.).

Voluta miliaria L., Syst. Nat., ed. x, p. 730, 1758.

S. Thomé and C. Verdes (Nobre); Portugal to Mediterranean and Mogador; Madeira (Watson); Canaries (McAndrew).

Cymbium neptuni (Gmel.).

Voluta neptuni Gmel., Syst. Nat., ed. xiii, p. 3467, 1791.

S. Thomé and C. Verdes (Nobre); C. Blanco, Dakar, Hann, Rufisque, Rio de Oro, Conakry and Guinea (Dautz.); Angola (Nobre).

Mitra barbadensis (Gmel.).

Voluta barbadensis Gmel., *l.c.* p. 3455, 1791.

S. Thomé (Nobre); West Indies; Ascension (Smith and Stearns).

Pseudoliva sepimentum (Rang).

Buccinum sepimentum Rang, Mag. Zool., 1832, pl. xviii.

S. Thomé (Nobre); Principe (Tryon); Cotonou (Dautz.). Nobre repeats ¹Tryon's error of *sepimana*.

Nassarius tritoniformis (Kiener).

Buccinum tritoniformis Kiener, Coq. Viv., p. 108, pl. xxx, f. 2, 1841.

S. Thomé (Nobre); many places from Conakry to the Congo (Dautz.); Whydah (Smith); Senegal (Kiener).

Murex hoplites Fischer.

J. de C., xxiv, p. 236, pl. viii, f. 3, July, 1876.

S. Thomé, C. Verdes, Loanda (Nobre); Goree (Fischer); Rio de Oro (Font); Dakar, Rufisque, C. Rouge, etc. (Dautz.).

M. tumulosus Sowerby.

Conch. Ill., f. 17, January, 1841.

S. Thomé (Nobre); Rio de Oro (Font); El Frey, Cansado and Aleibataf (Dautz.).

M. blainvillii Payr.

Cat. Moll. Corse, p. 149, pl. vii, f. 17, 18, 1826.

S. Thomé (Nobre); Annobon Is. (Dunker); Mediterranean.

Thais ascensionis (Q. & G.).

Purpura ascensionis Q. & G., Voy. Astrolabe, ii, 559, pl. xxxvii, f. 20—23, 1832.

S. Thomé (Hoyle).

T. coronata (Lam.).

Purpura coronata Lam., An. sans Vert., vii, p. 241, 1822.

S. Thomé, Principe and C. Verdes (Nobre); Spanish Guinea (Hidalgo); many localities from Conakry to Banana (Dautz.).

Purpura consul Chem. S. Thomé (Nobre). This can hardly be the *P. consul* of Lamarck as that is an eastern species. Probably Nobre's shells were large *hæmastoma*.

Cymatium lampas (L.).

Murex lampas L., Syst. Nat., ed. x, p. 742, 1758.

S. Thomé and C. Verdes (Nobre); Canaries (McAndrew); Madeira (Watson); English Channel to Mediterranean and Mogador. This is the species formerly known as *nodiferum* Lam.: for the change of name see Smith in *J.C.*, xiv, p. 227. I take Nobre's *Triton variegatum* to be also referable to this species.

C. ficoides (Rve.).

Triton ficoides Rve., Conch. Icon., II, pl. xiii, f. 51, June, 1844.

S. Thomé (Nobre); C. Verdes ('Talisman'); Baie de Hann (Dautz.); Africa (Reeve).

Triton obscurum Rve. Nobre records this from S. Thomé and the C. Verdes. It is, however, an eastern species and I take his records to refer to ¹*Colubraria testacea* (Mörch). Dunker's shell from ²Anno-bon Is. which he queries as *Tritonium obscurum* Rve. was most likely the same thing.

C. tranquebaricum (Lam.).

Triton tranquebaricum Lam., An. sans Vert., vii, p. 189, 1822.

S. Thomé and C. Verdes (Nobre). There seems to be doubt as to the real locality for this species; Lamarck gives Indian Ocean, but Cuming is said to have dredged it at the mouth of the Gambia.

Bursa scrobilator (L.).

Murex scrobilator L., Syst. Nat., ed. x, p. 749, 1758.

S. Thomé and C. Verdes (Nobre); Madeira (Watson); Canaries; Mediterranean (Linné); Senegal.

It is curious that this name appears almost universally in literature as *scrobiculator*.

Cerithium spp. incert.

S. Thomé (Hoyle). I have had an opportunity of examining these specimens in the Manchester Museum and find that they are ³*C. guinaicum* Phil. and *C. atratum* Born.

Potamides fuscatus (L.).

Murex fuscatus L., Syst. Nat., ed. x, p. 755, 1758.

S. Thomé, Principe, Guinea (Nobre); Spanish Guinea (Hidalgo); Gambia; Liberia.

¹ cf. *J.C.*, xiv, 249.

² Index Moll. Guin., p. 27.

³ cf. *J.C.* xiv, 250.

Planaxis striatulus Phil. S. Thomé (Hoyle). No specimens so labelled are now to be found in the Rattray collection at Manchester. The species was described by Philippi with habitat unknown and under the circumstances it seems better to drop it from the S. Thomé list.

Littorina striata King.

Zool. Journ., V, p. 345, 1832.

S. Thomé and C. Verdes (Nobre); Madeira; Azores (King); S. Helena (Watson); but Smith prefers to refer the ¹S. Helena shells to *miliaris* Q. & G.

Calyptæa chinensis (L.).

Patella chinensis L., Syst. Nat., ed. x, p. 781, 1758.

S. Thomé (Nobre); Britain to Mediterranean and Black Sea; Canaries; Madeira; W. African coast to Mossamedes.

Natica fanel Récluz.

There can be very little doubt that Nobre's *N. millepunctata* Lam. was an error for *N. fanel* and that McAndrew's Canarian record was the same. *N. fanel* is very much like small *N. millepunctata*, and Lobito—one of Nobre's localities for his *millepunctata*—is a place where *fanel* is known to occur. *N. millepunctata* seems to be a strictly Mediterranean species.

N. fanel is also known from C. Verdes; Madeira (Watson); Senegal; Loanda, Lobito, Mossamedes and Bahia de los Tigres (Dautz.)

N. collaria Lam.

An. sans Vert., vi (2), p. 200, 1822.

S. Thomé, C. Verdes, Principe and Angola (Nobre); Whydah (Smith); Lomé (Togoland) and Cotonou (Dautz.); Cape Blanco and Senegal.

N. variabilis Reeve.

Conch. Icon., IX, pl. xxiii. f. 104, 1855.

S. Thomé (Nobre & Dautz.); C. Verdes (Nobre); Canaries and Madeira (Watson); Casa Blanca (Monterosato); Senegal, Libreville, Banana, Loanda and Lobito (Dautz.).

This is the unnamed *Natica* recorded by ²McAndrew from the Canaries "sh. to 60 f." (*fide* Watson).

N. canrena L. and *N. zonaria* Lam. are both recorded from S. Thomé by Nobre. I have reason to suppose that both records were founded on examples of *N. turtoni* Smith.

Sinum bifasciatum (Récluz).

Sigaretus bifasciatus Récluz, *J. de C.*, ii, p. 190, pl. vi, f. 3, 4, 1851.

S. Thomé (Récluz); Senegal (Dautz.); Benguela (Dunker as *Sig. menkeanus* Dkr.).

¹ P.Z.S., 1890, p. 283.

² On the Geogr. Distrib. of Test. Moll., p. 32.

Nerita atrata Chem.

Recorded by Hoyle from S. Thomé, Conakry, Dakar and C. Verdes. I have seen the S. Thomé specimens collected by Rattray and they are *senegalensis* Gmel.

Trochus (Clanculus) tristis Gray. S. Thomé (Hoyle). I cannot trace this specific name, and do not find that Gray ever described a *Trochus tristis*. No specimens so labelled are now in the Manchester Museum and the name may be dismissed from our list.

Clanculus spadiceus (Phil.).

Trochus (Clanculus) spadiceus Phil., Zeitschr. f. Malak., v, p. 125, 1848.

S. Thomé and C. Verdes (Nobre); Annobon Is. (Dunker); Mossamedes (Nobre).

C. cruciatus (L.).

Trochus cruciatus L., Syst. Nat., ed. x, p. 757, 1758.

S. Thomé and C. Verdes (Nobre & Rochebrune); Mediterranean.

Trochus (Gibbula) cicer Menke (?) S. Thomé (Hoyle). I have seen Hoyle's specimens and find that they are *Clanculus kraussi* (Phil.).

Fissurella obtusa Sow. S. Thomé (Hoyle). These shells are the same as what we have¹ recorded as *F. nubecula* (L.).

Fissurella sp. incert. (near *F. riippelli* Sow.). S. Thomé (Hoyle). In the tray so labelled at the Manchester Museum are two shells—one a very fine *F. menkeana* Dkr., the other a *F. gibberula* Lam. with rather pale markings.

Patella nigrosquamosa Dkr.

Zeitschr. f. Malak., iii, p. 25, 1846.

S. Thomé and Angola (Nobre); Azores (Dunker); Gaboon, Benguela and Praya Amelia (Dunker & Dautz.); Natal (Krauss). Nobre unites this with *natalensis* Krauss.

Ostrea cucullata Born.

Index Mus. Caes. Vindob., p. 100, 1778.

S. Thomé (Hoyle, as *O. forskali* Chem.); S. Thomé and Mossamedes (Dautz.); Benguela and Principe (Dohrn); Red Sea and Indian Ocean.

Spondylus unicolor Sow. S. Thomé (Hoyle). This species I find to be the same as we² recorded under the name of *gædaropus* L. *S. unicolor* Sow. was described from an unknown locality and Mr. Fulton in a recent³ revision of the genus says that he is unable to identify it satisfactorily. At the same time I feel somewhat uncertain as to our identification with *gædaropus* L.

¹ J.C., xiv, p. 268.

² J.C., xiv, 269.

³ J.C., xiv, 355.

Pecten gibbus L. S. Thomé (Nobre).

P. concentricus Say. S. Thomé (Hoyle).

These two names both refer to the species which we record as *flabellum* Gmel. The misuse of the name *gibbus* L. for this species is fully explained by ¹Bavay. Further localities are Fernando Po and Loanda (Nobre); Cape Blanco and Dakar (Dautz.).

Pteria atlantica (Lam.).

Avicula atlantica Lam., An. sans Vert., vi (1), p. 148, 1819.

S. Thomé, Principe and C. Verdes (Nobre); Morocco; Senegal; Tamara, Conakry, Libreville and Banana (Dautz.). This is no doubt Hoyle's sp. incert. from Conakry.

Melina dentifera (Krauss).

Perna dentifera Krauss, Südafrik. Moll., p. 28, pl. ii, f. 9, 1848.

S. Thomé (Hoyle, as *Isognomon nucleus* Lam.?). I consider Hoyle's sp. incert. to be a very young valve of the same species, which is characterised by the small number of grooves on the hinge-line. It is a fairly common S. African shell.

Arca (Senilia) senilis L.

A. senilis L., Syst. Nat., ed. x, p. 694, 1758.

S. Thomé (Nobre & Hoyle); generally distributed on the W. African coast from Senegal to Mossamedes (Chalmers); C. Verdes (Nobre). Gruvel says that it is sold in the Dakar market at ten centimes a dozen.

A. tetragona Lam.

An. sans Vert., vi (1), 35, 1819.

S. Thomé and C. Verdes (Nobre); Mogador and Madeira (Watson); Canaries (McAndrew); Ascension (Stearns); Finmark to Mediterranean.

A. pulchella Reeve, Conch. Icon., II, pl. xvii, f. 122, 1844.

S. Thomé (Nobre); Mediterranean; Rufisque (Dautz.); C. Verdes; Angola (Welwitsch).

A. nivea Chem. S. Thomé, Principe, Fernando Po and Angola (Nobre). ²This is the species which we recorded as *stigmosa* Dkr. and Hoyle as *decussata* Sow.

Arca sp. incert. Loanda (Hoyle). This is not a S. Thomé record, but it is worth while to note that the specimen is *bouvieri* Fischer.

Glycymeris rubens (Lam.).

Pectunculus rubens Lam., An. sans Vert., vi (1), p. 51, 1819.

S. Thomé, C. Verdes and Angola (Nobre). ³Lamy regards this as a synonym of *G. glycymeris* (L.).

¹ *J. de C.*, lviii, p. 317.

² *J.C.*, xiv, p. 271

³ *J. de C.*, lix, p. 138.

G. formosus (Reeve).*P. formosus* Reeve., Conch. Icon., I, pl. viii, f. 48, 1843.S. Thomé (Hoyle); Principe (Rang, *fide* Lamy); C. Verdes (Locard).**Dosinia isocardia** Dunker.

Zeitschr. f. Malak., ii, p. 167, 1845.

S. Thomé (Nobre); Angola (Welwitsch); Benguela and Loanda (Dunker); Akkra, Lomé and Gd. Popo (Dautz.); C. Verdes (Stearns); Senegal.

D. orbignyi Dunker, *l.c.*

S. Thomé and Loanda (Hoyle); Benguela and Loanda (Dunker); C. Verdes (Stearns); Dahomey, Los Is., Akkra, Lobito, Mossamedes and Bahia de los Tigres (Dautz.).

Pitaria tumens (Gmel.).*Venus tumens* Gmel., Syst. Nat., ed. xiii, p. 3292, 1791.

S. Thomé (Nobre); Cape Blanco and Senegal to Gd. Popo (Dautz.); Lower Guinea (Dunker).

Donax rugosa L.

Syst. Nat., ed. x, p. 682, 1758.

S. Thomé, Loanda and Mossamedes (Nobre); C. Verdes (Stearns); Senegal to Angola (Hoyle, Chalmers and Dautz.); Cape (Sowerby, *fide* Dautz.); Accra (Hoyle).*Tagelus gibbus* Spengler. S. Thomé (Hoyle). No specimens now forthcoming in the Rattray collections and it will be well to disregard the record until further evidence comes to hand.*Macra largillierti* Phil. S. Thomé, C. Verdes, Principe, Accra and Loanda (Hoyle). The S. Thomé examples are worn, decorticated valves which certainly cannot be differentiated from *glabrata* L.**Lucina leucoma** (Turton). Conch. Dithyra, p. 113, pl. vii, f. 8, 1822.

S. Thomé, C. Verdes and Fernando Po (Nobre); Madeira (Watson); Canaries (McAndrew); Britain to Mediterranean; Senegal (Dautz.); Loanda (Hoyle); S. Africa (Krauss and Sowerby).

Tellina madagascariensis Gmel.

Syst. Nat., ed. xiii, p. 3237, 1791.

S. Thomé (Nobre); C. Verdes (Stearns); Loanda (Hoyle); Lobito, Mossamedes, Bahia de los Tigres (Dautz.); Cape.



L. PFEIFFER'S ENGLISH SPECIMENS OF *HELIX GIGAXII*.

BY DR. F. HAAS.

(Read before the Society, February 7th, 1923).

At the end of his paper on "The occurrence of *Helicella heripensis* (Mabille) in Great Britain," in Proc. Malac. Soc., x, pp. 39-41, pl. ii, 1912, Stelfox advances the opinion that the *Helix caperata* var. *gigaxii* of Jeffreys and other British authors, as well as Westerlund's *H. gigaxii*, is probably *H. heripensis*.

The statement that *Helicella gigaxii* (Charp.) occurs at all in England goes back to L. Pfeiffer. This author first mentions it in 1848 in his Mon. Helic i, p. 167, as *H. caperata* var. β , *Helix gigaxii* Charp. MSS. being added as a synonym, and the specimens are stated to have been collected by H. Cuming at "Highbycombe Bueks (sic) Britanniae" [obviously High Wycombe in Bucks.—Translator]. Later on Pfeiffer must have been convinced that his var. β of *H. caperata* was a good species to which the name *H. gigaxii* Charp.—previously given as a synonym—should be applied, as he made use of this designation in 1850 in the Zeitschr. f. Malak., vii, p. 85, and repeated it in 1853, in the third volume of the Mon. Helic., p. 133.

Charpentier never described the species and cannot, therefore, be accounted its author; it must stand as *H. gigaxii* Pfr. and was first figured by Pfeiffer in the Martini-Chemnitz Conchylien-Cabinet, Helix, iii, p. 316, pl. 128, f. 24-30. Only figures 29 and 30 represent English *H. gigaxii*; the previous ones (24-28) are taken from South of France specimens, which Pfeiffer considered to be particularly typical. In the course of studying Spanish land-shells I had occasion to compare several forms with *H. gigaxii*, but found Pfeiffer's figures too poor to enable me to form a definite opinion upon this species. I, therefore, requested the Stettin Natural History Museum, which has Pfeiffer's collection, to be good enough to lend me his original specimens of *H. gigaxii*, and as they most kindly acceded to my request I was enabled to establish the following conclusions:—

The South of France *H. gigaxii* (collected at Arles and Vaucluse) belong to a form of the *caperata* group which replaces that species in that region and must be recognised as a distinct species; to which also my N.E. Spain shells belong.

On the other hand the English shells (I have before me the original examples from Highbycombe, the ones figured in Martini-Chemnitz) have nothing to do with the true Mediterranean *H. gigaxii*, but undoubtedly belong to *Helicella caperata* Mont. Inasmuch as

Westerlund, as well as Jeffreys, and other British authors base their English records of *H. gigaxii* on L. Pfeiffer, the species intended by them must likewise be *Helicella caperata*, and not *H. heripensis* (Mab.) as Stelfox supposed.

(Translated by the Editor).

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

521st Meeting, held at the Manchester Museum, September 1st, 1923.

Mr. R. Standen in the chair.

New Members Elected.

Fridthjof Ökland.

Ralph W. Jackson.

Candidates Proposed for Membership.

W. R. B. Oliver, 26, Brandon Street, Seatoun, Wellington, New Zealand (introduced by J. R. le B. Tomlin and J. W. Jackson).

A. E. Ellis, 97, Northampton Road, Market Harborough (introduced by A. R. Horwood and J. W. Jackson).

Miss Martha Caroline Moore, M.A., 25, Galloway Road, Waterloo, Liverpool (introduced by J. W. Jackson and R. Standen).

Member Deceased.

Sir Henry Hoyle Howorth.

Resignation.

George Nelson.

Papers Read.

"Mollusca from the Belgian Congo (iii)," by G. C. Spence.

"A columnar form of *Xerophila virgata* (da Costa)," by J. W. Taylor, M.Sc.

Principal Exhibits.

By Mrs. Gill: *Cypræa scurra*, *carneola*, etc.

By Mr. R. Standen: *Cypræa helvola* with all the known varieties.

By Mr. H. de W. Marriott: *H. arbustorum* and *H. hortensis* vars. from Sutton Woodbridge, Suffolk.

By Mr. E. R. Brown: Postage stamps with shell-designs; Iraq, 1 anna, with border of *Cyp. annulus*; Travancore, 2 chuckrams, with chank shell on face and in watermark.

By Mr. G. C. Spence: *Achatina weynsi* Dautz., from Alberta, near Bumba; *Trachycystis seminium* (Mor.) from Boteke; *Gudeëlla mixta* (Smith) from Boteke and Leverville, Belgian Congo.

By Mr. J. W. Jackson: *Paludestrina jenkinsi* and other species, from flood débris of R. Ribble, below Mitton Bridge, W.R. Yorks.

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New Members, Resignations, Deaths, etc., will be found in the Proceedings, pp. 25—31, 53—55, 96, 120—127.

Paludestrina jenkinsi new to Fifeshire (Vice-County 85).—With further reference to my notes on the occurrence of *P. jenkinsi* in Scotland, I have pleasure in reporting its occurrence in Fifeshire, having located it in Lundin Burn, Tayport, in N.E. Fife. On September 15th, 1922, while gathering *Pisidia* in this burn, I unexpectedly found *P. jenkinsi* in small numbers. Lundin Burn is a slow running stream of about a yard in width, with a clean sandy-muddy bottom and very few stones. I took *P. jenkinsi* while scooping among the herbage growing under the bank, and also took an occasional specimen from the mud in the middle of the burn. These shells are noticeably larger than those I took in Perthshire. The point worked is situated some 100 to 200 yards from the mouth of the burn where it flows into the Estuary of the Tay at Tayport. This station for *jenkinsi* is, like the Perthshire localities, under the influence of the tide. So far I have failed to trace it farther inland in purely fresh water. As it is suggested that this mollusc has been introduced to this country with imported timber, it is easily understood how *jenkinsi* now appears at Tayport, as ship-loads of timber from the Baltic ports and elsewhere are constantly arriving in Tayport Harbour, where they are unloaded and stacked in large piles.—E. CRAPPER (*Read before the Society*, November 1st, 1922).

OBITUARY NOTICE: J. T. MARSHALL.

BY J. R. LE B. TOMLIN, M.A.

(Read before the Society, January 2nd, 1924).

INFORMATION has only recently come to hand of the death, on Jan. 15, 1922, of J. T. Marshall, for many years a member of this Society and a valued contributor to the Journal. He is best known for his long series of papers entitled: Additions to "British Conchology," written to supplement his old friend Jeffreys' *magnum opus*, and forming an admirable complement to that work. He resigned his membership of the Society in 1919 and had latterly lost touch with things conchological.

James Thomas Marshall was born at St. Helier, Jersey, in 1842, his father being a tailor in the town, and on leaving school was sent to London and articed to Sir George Reed & Co. of Paternoster Row, printers and publishers. At the end of five years he returned home and was for twelve months on the staff of the "Jersey Times" newspaper, but "finding little scope in that island"—to quote his own words—he returned to London in 1864 and obtained a billet as compositor on "The Times." Here he remained for twenty years, his summer holidays being invariably devoted to dredging and collecting. In this he collaborated frequently with Leckenby, and some notable work they did in the North Sea and on the Doggerbank is described in a joint paper in the *Ann. & Mag. Nat. Hist.*, December, 1875. Among other novelties for that area they report *Axinus croulinensis*, *Neera cuspidata* and *Trochus occidentalis*.

Eventually the constant strain of night work brought on insomnia and breakdown; Marshall was constrained to leave London, and carried on a stationer's business in Cheltenham for the next five years. He then settled at Torquay and systematically worked the Devon and Cornish coasts, with occasional trips further afield: in and about Torbay much work was done, and such interesting species as *Philine nitida* and *Philine angulata* were discovered, as well as the habitats of ¹*Montacuta ferruginosa* and ²*Odost. rissoides*. In 1903 he sold his house at Torquay and also parted with his shell collections and for the rest of his life had no fixed home; he wintered regularly at Bournemouth and spent the rest of the year travelling. A succession of visits to the Channel Isles, all of which he worked systematically, resulted in the discovery of the habitats of such

¹ *J. C.*, vi, 399.

² *J. C.*, ix, 227.

rarities as *Rissoa lactea*, *R. striatula* and *Chiton scabridus* and he also wrote papers on ¹*Gwynia capsula* and ²*Pleurotoma lævigata* and on the discovery of ³*Adula simpsoni*, found on the skull of a dead whale; it was, however, to his "Additions" series that his chief energies were devoted.

In 1916 he was offered the Presidency of the Conchological Society but declined it for reasons of health.

His wife, who was a Miss Charlotte Leat, of Ringwood, Hants, died on January 4, 1922, at the age of 90, and he only survived her a few days. There were no children of the marriage.

Marshall had a particularly good eye for the smaller marine things and was in great request for sorting dredgings. With a certain amount of aid from Jeffreys he sorted the whole of the dredgings of the 1869 and 1870 cruises of the 'Porcupine,' as well as those of the 'Valorous,' the 'Shearwater' and the 'Newport.' His patience and industry in this work were extraordinary, and there are comparatively few species in his British collection that do not possess an extensive series of juveniles ranging down to the minutest size. The *Pyramidellidæ* were his forte, and his notes on the discrimination of critical forms in this family are especially helpful and valuable. He estimated that his own collection contained 40,000 specimens of the group.

He described several new species and a good many new varieties, some of the latter being of but trivial importance, as was also the case with some of the Jeffreysian named varieties.

He had also a collection of palæarctic shells from outside Britain, of which the marine portion was presented to the University College Museum at Nottingham about 1883, and the terrestrial portion to the same Museum some twenty years later.

The following is believed to be a complete list of his writings:—

Species versus Varieties—*J. C.*, i, 131.

Note on Abnormal Form of *Cylindrella*—*J. C.*, i, 380.

Note on a List of Shells taken at Guernsey—*J. C.*, i, 380.

On a Parasite of *Limnæa truncatula*—*J. C.*, iv, 10.

On some New British Shells—*J. C.*, v, 186.

On *Terebratula papillosa* Marshall—*J. C.*, v, 278.

Argiope decollata at Scilly—*J. C.*, v, 361.

The Marine Shells of Scilly (Burkill & Marshall)—*J. C.*, vi, 53.

Note on the Marine Shells of Scilly (Burkill & Marshall)—*J. C.*, vi, 84.

On *Hydrobiæ* and *Assimineæ* from the Thames Valley—*J. C.*, vi, 140.

¹ *J. C.*, vii, 339.

² *J. C.*, xiii, 304.

³ *J. Malac.*, vii, 167.

- Further Notes on Brit. *Hydrobiæ*—*J. C.*, vi, 224.
Dredging off Connemara—*J. C.*, vi, 250.
New Brit. Marine Shells—*J. C.*, vi, 260.
Guernsey Dredging—*J. C.*, vi, 280.
The Marine Shells of Scilly (Burkill & Marshall)—*J. C.*, vi, 345.
The Habitat of *Montacuta ferruginosa*—*J. C.*, vi, 399.
Additions to 'Brit. Conchology,' i—*J. C.*, vii, 241.
Ditto ii—*J. C.*, vii, 379.
Alterations in 'Brit. Conchology' (pt. iii of 'Additions')—*J. C.*, viii, 24.
Additions to 'Brit. Conchology,' iv—*J. C.*, viii, 338, 385.
The Marine Shells of Scilly—*J. C.*, viii, 431.
Additions to 'Brit. Conchology,' v—*J. C.*, ix, 61, 120, 165, 222, 284, 332.
Additions to 'Brit. Conchology,' vi—*J. C.*, x, 122, 190.
Tapes geographicus and *T. pullastra*—*J. C.*, x, 27, 166.
Additions to 'Brit. Conchology,' vii (with supplement) privately printed, 1903.
Additions to 'Brit. Conchology,' vii (revised)—*J. C.*, xiii, 179, 192, 223, 294, 324; xiv, 33, 65, 124; 182, 200, 324; xv, 44, 87, 168, 198.
North Sea Dredging (Leckenby & Marshall)—*Ann. & Mag. N. H.*, Dec. 1875.
New Brit. Marine Shells—*J. Malac.* iv, 35, 67.
On a Brit. Species of *Myrina* with a note on the Genus *Idas*—*J. Malac.*, vii, 167.
Note on *Myrina simpsoni*—*J. Malac.*, viii, 19.
Notes on the Brit. Species of *Buccinum*, *Fusus*, etc.—*J. Malac.*, ix, 35.

The following is a list of the new forms described by him. No notice is taken of names which appeared in the privately printed tract of 1903, as this certainly could not be considered a valid publication under the International Rules of Nomenclature.

The references are all to this Journal unless otherwise stated.

- Terebratulula papillosa*—v, 186, 278.
 * *Mytilus edulis* var. *pallida*—xiv, 126.
 * *M. modiolus* var. *cylindrica*—vii, 244.
 * *M. barbatus* var. *depressa*—vii, 245.
Myrina simpsoni—*J. Malac.* vii, 167.
Nucula nitida var. *turgida*—Ann. Mag. Nat. Hist. (4) xvi, 391.
 „ „ var. *radiata*—vii, 245.
Scintilla eddystonia—*J. Malac.* iv, 35.
Montacuta bidentata var. *triangularis*—vii, 246.

- M. ferruginosa* var. *ovata*—viii, 350.
Axinus croulinensis var. *truncatus*—xiv, 186.
 * *Cardium aculeatum* var. *depressa*—vii, 246.
 " *tuberculatum* var. *suborbicula*—vii, 246.
Venus fasciata var. *pallida*—xiv, 200.
 " *gallina* var. *alba*—vii, 247.
 * *Psammobia tellinella* var. *purpurea* } vii, 247.
 * " " var. *lactea* }
 " *ferroensis* var. *pallida*—viii, 371 : cf. xiv, 201.
Donax vittatus, var. *cuneata* } vii, 247.
 " " var. *albida* }
Scrobicularia alba var. *oblonga*—vii, 247.
Pholas dactylus var. *cylindracea*—xiv, 207.
 * *Trochus magus* var. *conica*—vii, 250.
 * *Lacuna puteolus* var. *plicata* (afterwards withdrawn)—vii, 250.
 " *pallidula* var. *naticiformis*—vii, 250.
 " " var. *imperforata*—xiv, 328.
 * *Rissoa striatula* var. *varicosa*—vii, 251.
 * " *striata* var. *distorta*—vii, 251.
 " *pulcherrima* var. *pellucida*—vii, 252.
Hydrobia similis var. *candida*—vi, 141.
 " *ventrosa* var. *carinata*—vi, 141.
Hydrobia ulvae var. *minor* }
 * " " var. *tumida* } vii, 252.
 * " " var. *decollata* }
Odostomia albella var. *subcylindrica*—vii, 252.
 " *acuta* var. *gracilis* } vii, 253.
 " " var. *attenuata* }
 * " *turrita* var. *nana*—vii, 253.
 " *plicata* var. *carinata*—vii, 253.
 " *diaphana* var. *inflata*—vii, 253.
 " *warreni* var. *intermedia*—vii, 253.
 " " var. *zetlandica*—ix, 288.
 " *spiralis* var. *coarctata*—vi, 347.
 " *oblongula* } *J. Malac.*, iv, 38.
 " " var. *ovata* }
 " *pusilla* var. *grossa*—vii, 384.
 " " var. *cylindrata*—vii, 255.
 " " var. *minuscula*—vi, 347.
 " *innovata* var. *nana*—vii, 385.
 " *verticalis*—ix, 333.
Eulima distorta var. *tumidosa*—vi, 263 (= *curva* Monts., vii, 382).
 " *anceps*—x, 124.
 " *philippii* var. *monterosatoi* (non Monts.)—x, 127, xv, 200.

- Eulima bilineata* var. *exigua*—vii, 258.
- ** „ „ var. *albida*—x, 190.
- Natica catena* var. *leckenbyi*—Ann. & Mag. Nat. Hist. (4) xvi, 393.
- ** *Adeorbis subcarinatus* var. *interrupta*—x, 192.
- Cerithiopsis tubercularis* var. *albescens*—vi, 56.
- ** „ „ *barleei* var. *interrupta*—xiii, 189.
- „ „ var. *scalaris*—xiii, 189 (in vii, 250 by error as *tubercularis* var. *scalaris* Monts.).
- „ „ *concatenata* var. *lactea*—vi, 348.
- „ „ *metaxæ* var. *alba* vii, 260.
- Purpura lapillus* var. *ovalis* Jordan Ms. } vii, 260.
- „ „ var. *gracilis* „ }
- Fusus turtoni* var. *attenuata* [*sic*]—*J. Malac.*, ix, 41.
- „ *consimilis*—*J. Malac.*, ix, 49.
- „ *propinquus* var. *lævis* } *J. Malac.*, ix, 46.
- „ „ var. *howsei* }
- Nassa reticulata* var. *minor*—vii, 261.
- Clathurella anceps* var. *soluta*—xiii, 297.
- „ *linearis* var. *minor*—xiii, 299.
- Defrancia linearis* var. *alba*—vii, 262.
- Pleurotoma brachystoma* var. *alba*—xiii, 303.
- „ *nebula* var. *fusiforme*—vii, 262.
- „ *rufa* var. *prælonga*—vii, 262.
- „ „ var. *ecostata*—vii, 263.
- * *Cypræa europæa* var. *minor*—vii, 263.
- Utriculus tomlinianus*—xiii, 334.
- Philine scabra* var. *circa*—vi, 57.
- „ *angulata* var. *circumlustra*—vii, 264.
- * „ *punctata* var. *cingulata*—vii, 265 (is a nomen nudum in vi, 348: Somerville's List prints it as *cingula*).
- Pleurobranchus plumula* var. *alba*—vii, 265.

*These names occur as nomina nuda in Somerville's List of "Brit. Marine Shells," January, 1886. *Murex aciculatus* var. *elongata* is there wrongly ascribed to Marshall instead of to Monterosato (v. *J. C.*, vii, 261).

**Occur as nomina nuda in *J. C.*, viii, 432.

I consider that *Donax vittatus* var. *truncatus* should stand as of Warren, not of Marshall (Irish Nat. iv, 18).

PALUDESTRINA JENKINSI IN SCOTLAND.

BY E. CRAPPER.

(Read before the Society, November 2nd, 1921).

P. jenkinsi was first discovered in Scotland by Mr. Barclay, of Perth, in the River Tay, at Elcho near Perth, in 1906. Elcho lies on the south bank of the river, so that this record belongs to "Perthshire Mid.," Vice County No. 88. This record was, however, not chronicled until 1910, when a notice appeared in the Proceedings of the Perthshire Society of Natural Science, vol. v., p. 69, to the effect that the find had been reported to a meeting of the Society held on 20th January, 1910. This record was subsequently admitted to the "Census," and remained until 1921 the only record for Scotland.

I have, therefore, pleasure in reporting its appearance in "Perthshire East," Vice County No. 89.

I first discovered it in fair numbers in a small burn flowing into the Tay, near Kinfauns, which lies on the north bank of the river, at a point almost exactly opposite Elcho, and about $3\frac{1}{2}$ miles east of Perth. This burn, at the point where I took these shells, is under the influence of the Tay, the latter flushing it for a short distance upwards at each high tide, and it is worthy of note that as one advances up this burn the shells become fewer, until at a point beyond the influence of the tide *P. jenkinsi* is entirely absent. The burn is normally shallow and clear, with a stony bottom, and it is on these stones that *P. jenkinsi* is found. Associated with it at this station are *Limnæa pereger* and *Ancylus fluviatilis*, in small numbers. Although I searched in the River Tay itself at this point, I failed to find any trace of *P. jenkinsi*. This is doubtless due to the very muddy bottom of the river at that particular place.

The second station for this shell in Vice County 89 is in Huntly Burn, near Longforgan, which lies about 14 miles from Perth, and, as at Kinfauns, it is confined to the stretch of the burn which is under the influence of the tide. It is, however, worth noting, that while at Kinfauns the River Tay is well above the salt-water limit, at Longforgan it is not, the river here being purely estuarine, and the water naturally showing a strong salinity. Associated with *P. jenkinsi* in Huntly Burn is only *Ancylus fluviatilis*, in very small numbers, the tidal flushings with water of some salinity probably being responsible for the scarcity of other fresh-water mollusca. At this station *P. jenkinsi* is infinitely more numerous than at Kinfauns, it being possible to collect several hundreds in the space of an hour, without once shifting one's position.

THE INTRUSION OF LAND SHELLS IN SOME DRAINED
LAKE-BEDS IN THE VICINITY OF BORÅS (SWEDEN):
WITH NOTES ON VARIETIES IN *VERTIGO LILLJEBORGI*

Westerlund.

By B. SUNDLER.

(Read before the Society, December 15th, 1923).

ABOUT 15 kilometres north-east of Borås there is a number of small lakes, the Varrunn lakes. They used to be much bigger than they are now, but in 1881 they were partially drained. By this procedure the surface of the lakes sank 282 centimetres and accordingly the superficial area of the lakes was considerably diminished. The soil which was in this way obtained to the benefit of the farmer was, however, for the most part of very poor value, consisting mostly of sand, a little mixed with clay here and there. Only a small part of the region could be tilled. The rest is swampy forests, consisting of alder, beech and pine, heaths sparsely wooded and watery meadows near the water-courses.

For a long time I had wished to examine the intrusion of the land shells on the old lake-bottoms. At last an opportunity of doing this offered itself during my vacation, in the summer of 1923. I am sorry to say, however, that I was much hindered in my work by the continual rain, which occasioned great inundations. I will give a brief account of the results I obtained at this investigation.

According to what I had expected I found the moist meadows, whose vegetation consisted of sedges and mosses, to be the best localities for shells. There I collected the following species: *Euconulus fulvus* Müller v. *alderi* Gray, *Hyalinia hammonis* Ström, *Zonitoides nitidus* Müller, *Cochlicopa lubrica* Müller, *Vallonia pulchella* Müller, *Vertigo antivertigo* Draparnaud, *Vertigo lilljeborgi* Westerlund, *Succinea pfeifferi* Rossmässler, and *Carychium minimum* Müller.

The swampy forests, on the contrary, were very deficient in shells. The following species occurred: *Vitrina pellucida* Müller, *Euconulus fulvus* Müller, *Hyalinia hammonis* Ström, *Hyalinia petronella* Charpentier, and *Patula rotundata* Müller. *Vitrina pellucida* was found only in one spot.

On the heaths I could not see a single species, and on the tilled ground only *Succinea putris* Linné.

The result of my investigations is then that only the species which are most fond of moisture have taken possession of the places most suitable for them. The species which prefer the forests with their mouldering leaves and twigs are mostly missing. No doubt this is due to the fact that, even in the adjoining woody region, they occur very sparsely, but it may also be explained by the fact that the forests have often been inundated and accordingly are too moist for them.

Of special interest is the fact that *Vertigo lilljeborgi* Westerlund, which is so rare in these regions, occurs in some of the above-mentioned meadows, together with *Vertigo antivertigo* Draparnaud, and in greater number than this. Two different forms occur, one four-toothed according to the formula 1-1-2, and one five-toothed (1-2-2), the latter rarer than the former. Westerlund describes the species in "Fauna Moll. Terr. et Fluv. Sueciæ, Norvegiæ, et Daniæ" 1871, 4-5 dentata, dentibus columellaribus 2, inferiore minimo, saepe defecto.

In "Sveriges, Norges, Danmarks och Finlands land och sötvattensmoll. Exkursionsfauna" 1884, he writes "4 teeth (1-1-2)." In 1887 he describes the species in "Fauna paläarct. Reg. Binnenconchylien,"—two columellar teeth, the lower one very small, often absent—and finally in "Tillägg till Sveriges Exkursionsfauna" 1904, *f. merita* West.: aperture with 4-5 teeth (1-1-2 or 3) very small and bulbiform, last whorl having a fine, almost invisible, red transverse rib without a groove behind the aperture. Westerlund accordingly defines the species in 1871 as 4 or 5 toothed, in 1884 as only 4 toothed, and in 1887 as mostly 5 toothed.

In order to clear up this confusion I propose that the species should be divided into three varieties: *f. quadridens*, formula 1-1-2, *f. quinquedentata*, formula 1-2-2 and *f. merita* Westerlund, the last variety according to the diagnosis given by him in 1904. By a procedure of this kind this species would be defined in accordance with *Vertigo antivertigo*, which is still more varying.

Helix aspersa m. **scalariforme** from Jersey.—Mr. C. J. Mogridge, of Fareham, Hants, has recently sent me, for exhibition before the Society, an interesting example of a scalariform *H. aspersa*, which he procured at Gorey, Jersey. The shell is 37mm. in height and 25mm. in breadth: the aperture measures 15 × 13mm. The whorls are greatly dislocated, and the spire extremely elongated.—R. STANDEN (*Read before the Society*, January 2nd, 1924).

A COLUMNAR FORM OF XEROPHILA VIRGATA (Da Costa).

By JNO. W. TAYLOR, M.Sc.

(Read before the Society, September 1st, 1923).

THIS peculiar variation of *Xerophila virgata* was found in the vicinity of Llandudno, on August 5th, 1905, by Mr. J. E. Crowther, of Elland, Yorkshire, who has generously added the shell to my collection.



X. virgata var.
X 2.

The specimen is 9 millimetres in diameter and 11 millimetres in altitude, of a somewhat uniform pale ochreous tint, without perceptible traces of the usual dark zonulation.

Though this shell in certain aspects shows a slight degree of local scalarity, this does not appear appreciably to influence the unusual form the shell has assumed.

Mollusca at Bridport, Dorset.—Having spent three weeks at Bridport in August this year I made it my duty to search for L. and F. W. Mollusca. Owing to the weather being very fine and dry I was not successful in finding any new species, but the following may be useful as a record: *Hyalinia helvetica*, very common, under stones, etc.; *Helix aspersa*, very common, and fairly large on the Downs at North Allington; *Helix hortensis*, very plentiful along roads around Walditch; *Helix nemoralis*, very scarce, I only found one in the marshy places under Thorncombe Beacon, along the coast; *Helicella virgata*, very plentiful along main road leaving Bridport eastwards; *P. rotundata*, very plentiful among stones, etc.; *Cochlicopa lubrica*, fairly common; *Limnaea truncatula*, very common in ditch between Bridport and West Bay; *Ancylus fluviatilis*, plentiful in River Brit as it enters Bridport; *Paludestrina jenkinsi* and *Neritina fluviatilis*, abundant in River Frome at Dorchester; *Planorbis spirorbis*, abundant in Mill Pond at Pymore; *Pomatias elegans*, abundant along road side, Bridport East.—GILES OWEN (Read before the Society, November 7th, 1923).

NOTE ON THE OCCURRENCE OF FOSSILIZED HELICOID CASTS ON THE INDIAN PEARL BANKS.

By JAMES HORNELL, F.L.S., F.R.A.I.,
Director of Fisheries (Retired), MADRAS.

(Read before the Society, February 6th, 1924).

DURING an inspection of the Indian Pearl Banks in the Gulf of Mannar, which I carried out in the spring of 1923, large numbers of the internal casts of a small species of Helicidæ, which appears to be *Planispira (Trachia) vittata* Müller, were found on almost every one of the hard bottom areas constituting the pearl banks. These banks or *párs* as they are known in the local Tamil vernacular (*pár*=rocky bank) extend parallel with the coast in a discontinuous chain from Pamban well nigh to Cape Comorin, at distances varying from 5 to 10 miles from the shore line. In certain sections, particularly off Tuticorin and off Pinnakayal, two series of these banks can be made out, an outer and an inner series. The banks referred to in the following note are those extending between Vaippar in the north to Manappad in the south, a distance of 40 miles. They were examined both by means of dredges and by local divers working naked, without dress or air supply other than that within their own lungs. Both methods yielded large numbers of *Helix* casts; frequently on banks covered thickly with pearl oyster spat, one or even several young pearl oysters were attached by their byssus to one of these casts. Had it been desired, hundreds could have been collected in a day on certain banks, notably on those of the inner series when we were working in localities where two series were present.

These casts varied greatly in appearance. There were some in which the actual *Helix* shell still persisted wholly or in part, forming a white limy casing to the brownish filling that composed the cast; these were comparatively rare compared with those where little or no trace of the original shell was present. These latter showed every degree of degradation, from specimens in which the whorls of the shell were clearly moulded on the surface of the cast, to those where abrasion and the growth and adhesion of foreign bodies upon the surface wholly or partially obscured the surface mouldings.

The material of these casts is usually a hard brownish argillaceous limestone, dense and close grained, with a varying amount of quartz particles intermixed in most cases.

These peculiar objects have been familiar to me for several years, as they were found whenever particular *párs* were examined. At first I was inclined to think that they were derived by denudation from one

of the littoral calcareous sandstone formations found at certain places along the western coast of the Gulf of Mannar, or that they had been freed by the breaking down of the looser and less well compacted matrix of outcrops of similar character upon the slightly raised submarine areas constituting the pearl banks themselves.

Careful consideration of the problem has shown that neither of these hypotheses is tenable. The first is negatived by the fact that these casts are as abundant on banks far distant from the shore exposures of rock containing fossilized *Helix* (which are indeed very local and extremely limited in extent), as in those close to them. Besides, I found no other fossilized remains associated with the *Helix* casts anywhere on the banks. Even if they were denuded in quantity from the matrix of a shore formation, it is most doubtful if the inshore currents are sufficiently powerful to transport them for miles seawards, having regard to their weight in the fossilized condition.

The second hypothesis is negatived by the conclusion to which I came eventually, that the pearl bank rocky bottom is to all intents and purposes a present-day formation—one which is growing continuously but very slowly, and has no direct relation to the rocky ridge which possibly forms the skeletal backbone lying at considerable depth below the present surface of the banks. It is already well-known that a great many of the stony blocks to which pearl oysters adhere, in this region owe their origin to the cementing together of dead shells, pebbles and sand grains, by the enveloping growth of certain calcareous seaweeds (*Lithothamnion*, &c.) and of crusting polyzoa, calcareous worm tubes and the like. My observations, however, go much further than this, and indicate clearly that the hard bottom on characteristic pearl banks in the Gulf of Mannar consists of small and usually slab-shaped or tabular blocks of recent calcrete scattered irregularly over the *pār* areas and separated from one another by sandy patches of varying extent. A pearl bank of characteristic structure in the Gulf of Mannar region may indeed be described as an area where patches of sand and tabular rock are closely interspersed, the rock predominating. It lies usually at a slightly higher level than the purely sandy areas that bound it both landward and seaward, the difference being usually from half to one fathom. Such areas are slowly growing upwards and therefore cannot be the source whence *Helix* casts could be derived from a rocky matrix by solution or other form of disintegration.

Collating the facts observed, it was noticed that not only was the number of casts markedly greater on the inner series of banks than on the outer, but that they were particularly abundant on the banks lying off the embouchure of the few considerable streams that empty into the sea in this locality. This was specially noticeable of those off the mouth of the Tambraparni River; this is the most important river

emptying into the Gulf of Mannar on the Indian side. It and its tributaries are subject to furious floods that rise exceedingly rapidly and often inundate extensive tracts of low-lying land along their banks. This suggested the theory that the *Helix* casts found on the pearl beds are derived from shells washed out to sea during river floods. Investigation showed this to be the correct solution of the problem. *Planispira vittata*, the particular species represented by the casts, is the common land snail of the arid, sandy tracts that are characteristic of the low land of this district (Tinnevely); the Cabul thorn bushes everywhere seen on waste land are its favourite haunt, especially when these bushes are young and their spreading branches lie close to the ground. On these and other of the plants found in dry localities numerous examples of living *P. vittata* may usually be found, while all around generally lie scattered quite considerable numbers of dead and empty shells of the same species. From experiments made it was found that these dead shells remain afloat for considerable periods if thrown into water, even if it be running rapidly, provided that wave action be absent. I have actually seen examples afloat in the Silavatturai lagoon near Tuticorin, and further evidence that these shells are carried into the sea by floods is the common sight of numbers cast up on the beach along high tide mark during the rainy season. It appears clear, therefore, that dead *P. vittata* shells are carried seawards in large numbers at this time, swept off the low lying lands by inundations, and that those that are so swept away during spells of fine weather, when the sea is calm, may travel to considerable distances before becoming filled with water and sinking to the bottom. The great majority will suffer shipwreck long before they reach the region of the pearl banks. Some may keep afloat longer and fall upon the hard bottom of the banks. I doubt, however, if any do.

Besides the empty shells, large numbers of living snails are also washed to sea by floods, and these will usually sink to the bottom at once, though it is probable that those that are not devoured will rise to the surface and float, as decomposition proceeds.

The specific gravity both of the empty and the living shells when they land on the bottom is low, and this, combined with their rounded shape, renders them particularly susceptible to movement by current action; the sand whereon they fall being bare and frequently hard and level, many shells will roll along till their progress is arrested temporarily by a lull in the current, or put an end to permanently by bringing up against some immovable obstruction.

The strength sometimes attained by the bottom current upon the pearl bank plateau has to be seen and felt to be fully appreciated. This experience I have had the good fortune to gain during certain of my descents to the bottom in a diver's dress. On one occasion I was

on a rocky bank in $8\frac{1}{2}$ fathoms when the current was so extremely powerful that I had the utmost difficulty in keeping my feet, I felt like a balloon buffeted by a gale of wind; to make headway against the current was practically impossible, and when one of my leaden soled boots came off, it was only after a great struggle that I was able to recover it, although I had drifted only a few feet away from it. Again, south of Adam's Bridge in $5\frac{1}{2}$ fathoms, I have found the current so strong that the water was thick with particles hurtling along like leaves before an autumn gale—all the miscellaneous débris of the sea-bottom, such as fragments of seaweed, *Zostera* leaves, mud and sand and unrecognisable rubbish. So thick was the water with moving objects that sight was blotted out at a distance of eighteen inches or two feet. When I knelt down and brought the window of my helmet within a few inches of the bottom, I saw the whole surface in active movement, sand and shell fragments rolling over and over in steady progression southwards. Such experiences demonstrate how these rounded shells both empty and with remains of the dead tissues within are carried along and may travel quite considerable distances till their further progress is arrested by lodging in some cranny on rocky bottom, or against the edge of a calcrete block. By such time they are full of a mixture of sand and mud, usually of a more or less calcareous nature. If some organic matter be present, as may be the case when living individuals are swept out to sea, this will accelerate the consolidation of the filling within the shell, the process being continued till all is fully compacted and a hard stony cast is produced. Then by chemical corrosion and mechanical abrasion the containing shell will gradually disappear, giving at last a naked brown cast, bereft of any remnant of the original shell. Some of these casts, as I have seen, eventually become incorporated in the growing masses of calcrete scattered over the surface of the *pár* and thus exhibit to us how a rock formation may contain fossils derived both from the sea and the land.



TWO NEW VARIETIES OF LIMAX CINEREO-NIGER Wolf.

By FRIDTHJOF ÖKLAND.

(Read before the Society, March 7th, 1923).

As far as I am able to see, the following varieties of *Limax cinereo-niger* Wolf, which I have collected on the West coast of Norway, have not previously been named, although perhaps both have been once mentioned from the eastern part of the country.

Var. **atroviridis** nov. Obscure olivaceous, the lower parts of body and shield of a palish green colour, keel and median line of the back white. Outer areas of the sole pigmented.

Between Aandulsnes and Höljenes in Romsdalen. The same variety, or another which is closely related to it, has previously been found in the neighbourhood of Veisten, in Gausdal (Westerlund: Fauna molluscorum terrestrium et fluviatilium Sveciae, Norvegiae et Daniae (1873) p. 13).

Only one specimen was found, on the 14th July, 1915, measuring about 15 cms. when fully extended. To the description given may be added that on each side of the white median line, on the hinder part of the body, there is a series of dark oblong spots, suggesting a band close to the median line. However, it is possible that the presence and extent of these spots are subject to individual variation and I have, therefore, excluded this point in the characterization of the variety.

In the same place were found *Limax cinereoniger* type and var. *pallescent* Dum. et Mort.

Var. **multimaculosa** nov. Body and shield green with small irregular black spots, unequally distributed. Outer areas of the foot-sole with still smaller dots, also somewhat unequally distributed. The young ones, when measuring 4-6 cms., are white with small black spots.

Maraak in Geiranger. Very probably the same variety was found previously at Asker, in the neighbourhood of Kristiania (O. S. Jensen: Indberetning om en i Sommeren 1870 foretagen Reise i Kristiania og Kr. sands Stift forat undersøge Land-og Ferskvands-Molluskerne samt Iglerne, Christiania, 1872, pp. 81-82).

On the 18th July, 1915, I found two specimens of this variety on a rock-strewn slope in the neighbourhood of Maraak, both of them 4 cms. long, and of a whitish colour, with very small black spots. The following day three other slugs were found in a similar locality, but situated in another part of the parish, measuring 4, 5 and 6 cms.

They resembled the animals first found, but the longest specimen had larger spots, which, however, scarcely exceeded 2 mm. in length. In this specimen the outer zones of the foot-sole show faint indications of pigmentation.

Four years later, on the 20th July, 1919, I found three larger specimens of this peculiar variety close by the road leading from Geiranger Fjord to the upper part of Maraak. These slugs, from 8 to 10 cms. long, were of a green colour, dotted with irregular black spots. The latter were considerably more numerous and close in the largest specimen than in the other ones, and especially on the hinder part of the body were somewhat confluent. One of the two smaller specimens had remarkably fewer spots than the others.

In alcohol the green colour has disappeared, and the slugs have turned whitish, except for the dark spots which have all been preserved. The smallest specimens, originally of a white ground colour, have attained a light brownish-grey, probably due to the fact that they have been in alcohol for another four years.

In addition to this variety, I found at Maraak *Limax cinereo-niger* type and var. *maura* Held.

The little specimen from Asker described by Jensen (l.c., pp. 80-81) is remarkably like the young ones of var. *multimaculosa*.

Rare Varieties of *Helix hortensis* in Glamorgan.—Variation in this species is not so great in Glamorgan as it is in *Helix nemoralis*. I have, however, taken this summer the following: from St. Brides-super-Ely, 10305; from Sully, three examples, all different, with the third band absent, viz. 12045, (12)0(45) var. *rufozonata*, and 12045 var. *arenicola*—a duplicate of which I have never seen. The var. *arenicola* is here locally common with several variations in the five-banded formulæ or the second band may be absent. The coalescence of all bands is easily detected by the narrow and chalky zone at the suture—a beautiful translucent shell. Quite distinct, however, is a shell corresponding to the var. *subalbida* Locard, figured by Mr. J. W. Taylor in the “Monograph,” which I regard as an *arenicola* with the formula 00000, always very common wherever this variety is found.—G. A. MARTIN (*Read before the Society*, December 15th, 1923).

VENUS LATILIRATA Sowerby.

J. R. LE B. TOMLIN, M.A., F.E.S.

(Read before the Society, February 6th, 1924).

IN the Appendix to Marine Shells of South Africa, 1897, p. 24, Mr. Sowerby describes and figures a remarkable Venerid shell from Durban, under the name of *Venus (Anaitis) latilirata*. Unfortunately this name is preoccupied, as in 1841 Conrad described a *Venus latilirata* in the Proceedings Acad. Nat. Sci., Philadelphia, vol. i, p. 28, from the Tertiary of Maryland—a species which has subsequently been found living in the Gulf of Mexico.

I should be inclined to assign the South African shell to the genus *Chione*, and, as Sowerby says, it bears a considerable resemblance to the W. Indian species *paphia* L. of the section *Lirophora* Conrad.

I propose to replace *latilirata* Sow. by the name *platyaulax*, which has the same meaning.

Nucella lapillus (Linné).—In seven weeks I found at Chideock only one example of the North Cornwall banded form of this shell. Mr. Winckworth tells me that a few years ago it was common under the Golden Cap. It is hard to understand why this change should have occurred. The rocks at Chideock are not of such a nature as to render banding a protection as seems to be the case in Cornwall.—ALAN GARDINER.

Lobster-pots as a collecting ground.—I have listed the following species picked up in the boat, or in the pots at Chideock: *Æquipecten opercularis* Linné, *Cardium nodosum* Turton, *Ensis ensis* Linné, *Gibbula magus* Linné, *Gibbula cineraria* Linné, *Gibbula umbilicata* Montagu, *Trivia europæa* Montagu, *Natica catena* da Costa, *Natica alderi* Forbes, *Scala clathrus* Linné, *Turritella communis* Lamarck, *Aporrhais pes-pellicani* Linné, *Buccinum undatum* Linné, *Ocenebra erinacea* Linné, *Trophon muricatus* Montagu, *Nassa reticulata* Linné, *Nassa incrassata* Ström, *Nassa pygmæa* Lamarck, *Bellardiella gracilis* Montagu, *Clathrella reticulata* Renier (requires confirmation).—ALAN GARDINER.

SOME SNAILS OF THE GENUS EUHADRA.

BY PROF. T. D. A. COCKERELL.

(Read before the Society, Feb. 6th, 1924).

LAST summer my wife and I spent a week at Tsuruga, on the west coast of Japan, and there had our first sight of the wonderful snail-fauna of that country in its native surroundings. About a mile from the town is a place where limestone rock is quarried, and used for making lime. Here we found an abundance of snails, including these species¹; *Ganesella japonica* (Pfr.), *G. stearnsii* Pils., *Ena reiniana omiensis* Pils., *Clausilia japonica nipponensis* Kobelt (it was delightful to pick these fine shells off the face of a rock), *Eulota similis* (Fér.), *E. kyotensis* Pils. (large form, perhaps distinct), *Plectotropis vulgivaga* (Schm. and Bttg.), *Euhadra oshimæ* (Pils.) (a very fine shell of the *E. mercatoria* group), *Cyclophorus turgidus* (Pfr.) and *C. herklotsi* v. Mts. Along with these were very large helicoids of two allied forms, identified at the U.S. National Museum as *Eulota* (*Euhadra*) *luhuana* (Sby.) and *E. luhuana peliomphala* (Pfr.). Another form referred to *peliomphala* was collected later at Yokohama, along with *Clausilia brevior* v. Mts.

Crossing over to Siberia, we found the large *Eulota maackii* (Gerstf.), *E. middendorffi* (Gerstf.), &c., and from a study of their soft parts, in comparison with that the Japanese *Euhadra*, I am convinced that we should do best to regard *Euhadra* as a distinct genus, originating in the Oriental region. It is first necessary to consider the precise classification of the Japanese shells collected. Gude (1900) pointed out that *E. peliomphala* has the surface (periostracum) distinctly shining, smooth, while that of *E. luhuana* is dull and rough. On this basis he recognised two species, and distributed the previously recorded varieties between them. This difference is clearly visible in the specimens I collected, one Tsuruga form being dull and coarsely striate or roughened, the other much smoother, and shining. The Yokohama form is shining, and hence referred to *peliomphala*. Nevertheless, in other respects, including the strong striation, the Yokohama snail is like the Tsuruga *luhuana*. The three types are separated thus :—

- (A.)—Surface entirely dull, strongly striate; shell large, depressed subconic, with widely open umbilicus; colour very pale yellowish, above with whitish flecks, slightly invading the band; one broad band above periphery (its width about 3 mm.) and umbilical region broadly black. Tsuruga.

¹ Kindly identified by Dr. Paul Bartsch of the U.S. National Museum.

(B.)—Shape and general appearance as in A, but surface shining; striæ strong; one broad band and dark umbilical region as in A, but no distinct light flecks. The Bluff, Yokohama.

(C.)—Shell large (max. diam. 41.5—42 mm.), low conic, somewhat more elevated than in A and B; last whorl considerably deeper and more swollen; lip tinged with pinkish; apex white, colour pale straw, with a narrow (scant 2 mm. wide) band above periphery; faint traces of bands two and four, or these absent; umbilical region pale, or narrowly dark, no callus over umbilicus. The shell is dextral, but it is otherwise almost exactly like Pilsbry's figure (taken from von Martens) of *E. quæsita*, Man. of Conch., vi., pl. 29, f. 12. I used a looking glass, and with the image of my shell reversed, could not point out any real difference. Tsuruga, occurring with A.

The form A is certainly not typical *luhuana*, but as these shells are understood it will pass as a rather poorly defined form of var. *nimbosa* Crosse (*maculata* Pils.). It seems probable, however, that the "*nimbosa*" character appears here and there in different races. Typical *luhuana* is said to have a narrow band.

The form B is what Hirase has figured as *pelionphala*, but it is not typical of that species. I have no adult shell of this form.

Form C I will call *E. pelionphala tsurugensis* n. subsp. I was convinced in the field that it was specifically distinct from A, as the two kinds occurred together, and no intermediates were found. I also believe it is specifically distinct from B, but I leave it for the present as a subspecies of *pelionphala*, in deference to the usage of those who are most familiar with the Japanese snails. It is manifestly of the *pelionphala* type as judged by the character of the surface. On account of its agreement (except that it is dextral) with von Martens' figure of *E. quæsita* it is natural to ask whether it is a dextral *quæsita*. All the shells seen were dextral, and Fulton (1917) maintains that *quæsita* is the sinistral form of *luhuana*. He further states that the real *quæsita* is the same as *perryi* Jay, and Pilsbry has figured the type of *perryi*, and it is not like our shell. Thus, even if the figure of *quæsita* referred to represents a sinistral phase or race of *tsurugensis*, it is still distinct from true *quæsita*. I have laboriously examined the accounts of other varieties of this series, and find nothing to match our shells. The varieties *aomoriensis* and *idzumonis* of Pilsbry and Gulick are similarly large, but of the *luhuana* type, with dull surface.

The topography of Japan is such that snails are isolated in hilly forested regions, separated by sea or by lowlands devoted to the culture of rice. It can hardly be doubted that many of the described "races," and many more not yet described, are good species, at least as good as the species of *Sonorella* and *Ashmunella* on the mountain ranges of Arizona and New Mexico. But practically all show considerable individual variation, and it is necessary to collect large series, make field observations, and dissect all the different types. Thus the study of Japanese snails may yet be considered to be in a preliminary stage. Probably the best way for a European or American to investigate the snail-fauna would be by means of a rather large boat, in which one could sleep and cook. The numerous sheltered harbours afford protection from rough weather.

According to Pilsbry *Euhadra chishimana* (Pils.) occurs in one of the Kuril Islands, but I feel convinced that no *Euhadra* enters Siberia. Gude (1900) cites *E. peliomphala* var. *herklotsi* Mts. from Olga Bay and Vladimir Bay, apparently supposing these places to be in Japan. These references are evidently based on A. Adams' records of *E. simodæ* (Jay) from the Siberian localities, but as Pilsbry remarks they are doubtless erroneous. I visited Olga Bay, and found no *Euhadras*. The Japanese *Euhadra* have very distinctive soft parts, the animal with a broad dark dorsal band, wholly lacking in the Siberian *Eulota maackii* and *E. middendorffi*, which are genuine *Eulota*. I noted of *Euhadra tsurugensis* in the living state that the animal had the back warm reddish, with a broad longitudinal black stripe; foot pale, with a reddish tint. The dorsal band is about 3.5 mm. wide. The genitalia agree in type with those of *E. perryi* as figured by Pilsbry, and differ especially from those of true *Eulota* by the well developed flagellum.

My measurements are based on a fresh specimen. Dart sac grey, about 15 mm. long; sacculated glands about it translucent whitish, about 12 mm. long and 2.5 wide; duct of globose spermatheca about 37 mm. long; albumen gland about 19 mm. long, pale ochreous; the very long extremely slender penis sac is purplish-grey, 65 mm. from base to retractor; from the retractor to the vas deferens is 18 mm., and the chalk-white flagellum is 19 mm. long. The proportions differ sufficiently from those of *perryi*, as figured by Pilsbry, to suggest a distinct species. The jaw of *E. tsurugensis* is strongly arcuate, bright ferruginous, with eleven very strong ribs. It much resembles the jaw of *perryi*, and is very different from that of *Eulota maackii*, which has five ribs.

If we consider *Euhadra* a genus distinct from *Eulota*, it still remains a question whether it should be subordinated to the earlier *Plectotropis* v. Martens. My opinion is that *Plectotropis* may well be

considered another valid genus. I have examined its type species, *P. elegantissima* (Pfr.), and also the closely related *P. cara* (Pilsbry). Some of the helices of the Pacific region of North America show a striking superficial resemblance to certain Japanese forms of *Euhadra*, and a similar aspect appears again among the genuine *Eulota* of Siberia, as though the North Pacific shores had some influence on the appearance of the snails.

MOLLUSCA FROM THE BELGIAN CONGO (III).

BY GEO. C. SPENCE.

(Read before the Society, September 1st, 1923).

Ptychotrema (Parennea) dykeiana Spence.—This species was described as new in my previous paper, *J. of C.*, vol. xvii, p. 20, but had shortly before been described under the name of *P. (Parennea) connollyi* by Messrs. Dupuis & Putzeys, in *Ann. Soc. Roy. Zool. Belgique*, Tome liii (1922) pp. 40/42. Major Dupuis kindly sent me a copy and also a cotype but, unfortunately, too late to stop publication. *P. dykeiana* therefore sinks as a synonym.

Achatina schweinfurthi Martens and var. **semifusca** Spence.—A further series of above from Leverville has recently reached me. It comprises two *semifusca* and fifteen *schweinfurthi*, which latter form a graded series from the typical flammulate form to an elongated unicolorous specimen. None of these latter approach *semifusca* which, so far, seems to stand apart.

I take this opportunity to add the following locality records :—

Achatina weynsi Dtz.—Alberta, near Bumba.

Trachycystis seminium (Mor.)—Under dead leaves.—Boteke.

Gudeëlla mixta (Smith).—Under dead leaves.—Boteke and Leverville.

DESCRIPTION OF A NEW VARIETY OF CYPRÆA ARABICA Linné.

By WALTER GYNGELL.

(Read before the Society, January 2nd, 1924).

C. arabica Linné, var. **splendens** nov.—Shell of large size, oblong, translucent, with flattened base. Back and margins almost pure cream ground colour, passing into creamy orange on base. Characteristic *arabica* markings on back are rich orange red, passing into reddish brown on margins and extremities.

Teeth moderately well developed, orange red.

		Long	Lat.	Alt.	In Collection.	
Dimensions	<i>a</i> (Type)	83	52	40	mm.	W. Gygell.
	<i>b</i> „	78	49	39	„	„
	<i>c</i> „	79	48	38	„	R. Standen.
	<i>d</i> „	78	48	38	„	{ R. D. Darbshire, Manchester Museum.

Habitat: Mauritius.

Four full grown specimens of this variety have been seen by me, and all agree in the general character of colour and pattern, as well as in their beautiful translucent appearance when held up to the light, a feature of so many deep water Mauritian shells. This variety is of more strikingly vivid coloration than any examples of *C. arabica* that I have seen.

Note on Planorbis strœmi.—*Planorbis strœmi* is well-known as a Holocene fossil in the Thames basin, and is now living in that river at several places above Windsor, also at Gosford Bridge, Oxfordshire. It seems strange that its range should be so restricted. Possibly it exists in some other of our large rivers. Immature *Pl. strœmi* might be passed over as *Pl. albus*, from which they differ by the absence of spiral striæ. Full-grown shells often resemble *Pl. carinatus*—from this species they differ by the absence of a true keel. In *Pl. strœmi* the apparent keel is a ridge of periostracum. I should much like to see any doubtful *Planorbis* from rivers other than the Thames.—J. E. COOPER.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

522nd (Annual) Meeting, held at the Manchester Museum, October 27th, 1923.

The President, Mr. R. J. Welch, M.Sc., M.R.I.A., in the chair.

Amongst those present were the following:—Messrs. A. T. Hopwood, G. C. Spence, R. Harrison, J. H. Lumb, L. E. Adams, J. J. Phelps, C. Horton-Smith, C. H. Moore, A. H. Lawson, H. de W. Marriott, J. G. Kitchen, W. H. Heathcote, Giles Owen, T. A. Coward, B. Bryan, R. Standen, C. Oldham, F. Taylor, R. C. B. Jones, Rev. L. W. Grensted, Mr. and Mrs. Gill, Mr. and Mrs. W. B. Wright, Mr. and Mrs. J. Wilfrid Jackson, Miss Jackson, Master R. S. Jackson and Miss Lindsey.

Appointment of Auditors.

Messrs. C. H. Moore and A. K. Lawson were re-appointed Auditors.

Appointment of Scrutineers.

Messrs. W. H. Heathcote and A. K. Lawson were appointed Scrutineers.

New Members Elected.

Miss M. C. Moore. A. E. Ellis. W. R. B. Oliver.

Candidates Proposed for Membership.

Ernest Joseph Hill Waters, B.Sc., 29, Parkdale, Wolverhampton ;
Arthur L. Darrah, "Rivington," Strines Road, Marple (both introduced by J. Wilfrid Jackson and G. C. Spence).

Presidential Address.

The President delivered an Address on "Some differences between the British and Irish Non-Marine Mollusca and their Habitats," illustrated with some 60 lantern slides.

A very cordial vote of thanks was passed to the retiring President for his most interesting address.

Votes of thanks were also accorded to the authorities of the Victoria University of Manchester (per Professor S. J. Hickson) for permission to hold the Annual Meeting in their rooms ; and to the authorities of the Manchester Museum for continued permission to hold the monthly meetings on their remises.

Election of Officers and Council.

The Scrutineers reported that the Officers and Council for 1923-24 as nominated by the Council had been unanimously elected (*see page 97*).

Exhibits.

By the President :—Series of Irish Non-Marine Mollusca from many Irish localities to illustrate his address ; and a series of pictures illustrating the use of shells as emblems in Heraldry.

By Mr. J. Davy Dean :—Five of the larger species of *Phædusa* or Asiatic *Clausilia* ; enlarged drawing in colour of *Vitrina major*, collected by Dr. Boycott at Cusop, Herefordshire.

By Mr. W. Gyngell :—Some fine examples of the reddish-yellow semi-translucent form of *Cypræa arabica* L. from Mauritius ; varieties of *Cypræa tigris* L. ; *C. scotti* Brod. ; *C. decipiens* Smith ; *C. hystrio* from N. Australia and other species.

By Mr. J. H. Lumb:—Live specimens of *Milax sowerbyi* from Pye Nest Allotment, Halifax.

By Rev. L. W. Grensted:—*Vallonia pulchella*, *Acme lineata* (new records) and other species from Llanfairfechan, Carnarvonshire; from Aber, *Pisidium personatum*, with teeth reversed (new record); from Llanbedr-y-Cennin, *Vertigo pusilla* (second record for Wales); from Hall Road, S. Lancs., *Vallonia pulchella* (new record).

By Mr. W. H. Heathcote:—Mollusca from Port St. Mary and vicinity, Isle of Man.

By Mrs. Gill:—A fine series of the rarer species of *Murex*.

By Mr. L. E. Adams:—Shells labelled by the late Hugh Cuming, from the collections of the late H. and A. Adams.

By Mr. B. Bryan:—Models of some Staffordshire Slugs.

By Mr. G. A. Martin:—Specimens of *Helix nemoralis* var. *citrinozonata* from St. Fagans, Glamorgan.

By Mr. J. T. Wadsworth:—*Testacella haliotide* from High Lane, Disley.

By Mr. A. T. Hopwood:—Specimens of Recent and Fossil *Conus*, including *Conus patens* Sow., a deep water species from South Africa, *C. planiliratus* Sowb., 1849, and *C. maculospira* Pils. and Johnson, 1922 (= *planiliratus* Sowb., 1870).

By Mr. Giles Owen:—Non-Marine Mollusca from Bridport, Dorset, 1923, and Aston by Dutton, Cheshire, 1923.

By Mr. J. Wilfrid Jackson:—Pleistocene, Oligocene and Purbeck-Wealden non-marine mollusca, including examples of "Paludina Marble."

By Mr. E. R. Brown:—A beautiful series of the genus *Oliva*, including fine colour forms of *O. textilina* Lam., *O. erythrostoma* L., *O. tremulina*, *O. pica*, *O. tenebrosa*, *O. irisans* Lam., *O. peruviana* Lam., and *O. maura*; series of Postage Stamps showing Conchology as displayed in Philately.

By Mr. R. Standen:—*Cypræa bicallosa* Gray, *C. tessellata*, *C. pyriformis*, *C. hungerfordi* Sow., *C. walkeri* Gray and *C. spadicea* Sow. Also a fine series of *C. tigris* L., *C. stolid*a and *C. sulcidentata*—with all their named varieties; and a number of British Slugs preserved in various ways.

By Mr. G. C. Spence:—*Achatina schweinfurthi* var. *semifusca* and series varying from type to unicolorous from Belgian Congo.

By Mr. R. Harrison:—Series of British Non-Marine Shells, from various localities.

By the Manchester Museum:—Series of British Marine Mollusca; *Amphidromus*; and *Harpa*, from the Kidson Taylor bequest.

Selections from the Society's Cabinet were also shown, including 20 drawers of beautifully mounted non-marine shells, bequeathed by the late J. Kidson Taylor.

ANNUAL REPORT.

THIS is the Forty-Seventh Annual Report of the Society. The membership at the last annual meeting was 273. Since then the Society has lost six members by resignation and two by death; seven have also been struck off the list on account of non-payment of arrears of subscription. The new members elected during the year amount to 21, so that the membership at present is 279, which shows a gain of 6 over last year.

The losses to the Society by death are William Evans and Sir H. H. Howorth. An obituary notice of the first-named appeared in "The Scottish Naturalist," Nov.-Dec., 1922, p. 169; and of the second in "The Geological Magazine," September, 1923, p. 431.

The usual monthly meetings, held at the Manchester Museum, have been fairly well attended. Twenty-eight notes and papers have been read, and several of these have since appeared in the *Journal*.

The Special Exhibits have been:—*Solaropsis*; British *Solen*; British *Succinea*; British Freshwater Operculates; and *Pseudotrochus* (= *Perideris*).

Since the last annual meeting three numbers of the *Journal* have been published; vol. 16, No. 10, October, 1922 (completing the volume); vol. 17, No. 1, January, 1923; and vol. 17, No. 2, July, 1923, comprising in all 96 pages of text (including Index to vol. 16, and List of Members, January 1923), two plates and seven text figures.

During the year Mr. R. Winckworth submitted a scheme for a Census of British Marine Mollusca. This was duly considered by the Council and fully approved, Mr. Winckworth being nominated Official Recorder. It is hoped that this very desirable piece of work will receive the support of many of our members, and ultimately result in a great increase in our knowledge of the distribution of the British Marine Mollusca.

Mr. H. McClelland also forwarded for the Council's approval a scheme for an Index of the four British Journals dealing with Conchology, viz. *Journal of Conchology*, *Proceedings of the Malacological Society*, *The Conchologist* and the *Journal of Malacology*. In view of the low state of the Society's funds, Mr. McClelland kindly offered to defray the entire cost of production. The scheme was approved by the Council, and the opportunity is taken here to place on record the thanks of the Society to Mr. McClelland for his most praiseworthy project. The compilation of this Index is well in hand, and its publication as a special number of the *Journal* is expected early next year.

It is very gratifying to the Society to learn that the Queen's University, Belfast, has conferred upon our President, Mr. R. J. Welch, M.R.I.A., the honorary degree of M.Sc., in recognition of his valuable contributions to Irish natural history.

The Library has been used by several of the members and has received additions from Lt.-Col. H. H. Godwin-Austen, Drs. H. Pilsbry, W. H. Dall, and J. C. Melvill, Messrs. Fridjthof Ökland, F. Booth, Paul Hesse, C. Hedley, B. Sundler, W. E. Alkins and the Trustees of the British Museum (Natural History).

The donations to the Cabinet have been few in number, the donors being Messrs. J. E. Cooper, E. Crapper and J. R. le B. Tomlin.

RECORDER'S REPORT.

SINCE the last report (vol. xvii, p. 27) the following (93) new records have been added to the Census:—

Cornwall W. (1):—*Sphaerium lacustre* (A. E. Ellis).

Devon S. (3):—*Vertigo minutissima* recorded last year is the form *Truncatellina britannica* (see vol. xvi, p. 263 and A. S. Kennard and B. B. Woodward in *Proc. Malac. Soc.*, vol. xv., p. 294).

- Somerset N. (6):**—*Helicella heripensis* (A. E. Boycott).
- Dorset (9):**—*Paludestrina stagnalis* (C. Diver), *Pisidium nitidum*, *P. obtusale* (J. E. Cooper).
- Hants S. (11):**—*Pisidium milium* (C. S. Coles), *P. pulchellum* (C. Ashford).
- Sussex E. (14):**—*Hyalinia lucida* (W. E. Brady), *Arion subfuscus* (garden : J. R. le B. Tomlin), *Unio pictorum*, *Paludestrina stagnalis*, *Planorbis vorticulus* (Lewes, Pevensey : see A. W. Stelfox, *Proc. Malac. Soc.*, vol. x (1912), p. 42), *Pisidium personatum* (C. Oldham).
- Kent E. (15):**—*Vertigo pygmæa* (J. E. Cooper).
- Berks (22):**—*Planorbis stræmi* (R. Thames at Cookham : J. E. Cooper).
- Oxford (23):**—*Ena montana* still lives in Shirburn Wood, Watlington (A. E. Boycott).
- Bucks (24):**—*Planorbis stræmi* (R. Thames at Bourne End : J. E. Cooper).
- Norfolk E. (27) and W. (28):**—*Paludestrina stagnalis* (E. J. Salisbury and A. E. Ellis).
- Bedford (30):**—*Vertigo edentula*, *Pisidium personatum* (C. Oldham).
- Northampton (32):**—*Helicella caperata caperata* (A. E. Ellis).
- Gloucester W. (34):**—*Helicella caperata caperata*, *Hel. heripensis*, *Vertigo pusilla* (Tarlton : J. H. Adams).
- Monmouth (35):**—*Paludestrina stagnalis* (A. E. Ellis).
- Hereford (36):**—*Agriolimax lævis* (E. W. Bowell), *Vitrina major* (Cusop : A. E. Boycott).
- Stafford (39):**—*Pupa marginata* (J. and W. Hill).
- Salop (40):**—*Punctum pygmæum*, *Azeca tridens*, *Hel. lapicida*, *Pupa secale*, *Vertigo edentula* (Shrewsbury Museum : R. A. Buddicom).
- Glamorgan (41):**—*Anodonta anatina* (A. E. Ellis).
- Brecon (42):**—*Clausilia laminata*, *Succinea elegans*, *Acme lineata* (A. E. Boycott).
- Carmarthen (44):**—*Helicella caperata caperata*, *Vallonia excentrica* (C. Oldham).
- Pembroke (45):**—*Pisidium personatum* (C. G. Barratt).
- Cardigan (46):**—*Vallonia excentrica*, *Acanthinula aculeata*, *Paludestrina ienkinsi*, *Sphærium corneum*, *Sph. lacustre* (C. Oldham).
- Montgomery (47):**—*Limax cinereoniger*, *Amalia sowerbyi* (garden), *Zonitoides excavatus*, *Vallonia pulchella pulchella*, *V. excentrica*, *Hel. striolata* (garden), *Vertigo pygmæa*, *Hel. arbustorum*, *Punctum pygmæum* (C. Oldham), *Pisidium pulchellum* (J. B. Morgan).
- Carnarvon (49):**—*Vallonia pulchella pulchella*, *Vertigo pusilla* (Llanbedr-y-Cennin), *Acme lineata*, *Pisidium personatum* (L. W. Grensted), *Pisidium nitidum*, *P. subtruncatum* (C. Oldham).
- Denbigh (50):**—*Acme lineata* (C. Oldham).
- Flint (51):**—*Clausilia laminata* (C. S. Elton).
- Anglesea (52):**—*Pisidium lilljeborgi* (J. G. Milne).
- Leicester (55):**—*Helicella caperata caperata* (A. E. Ellis).
- Notts (56):**—*Pisidium hibernicum* (W. A. Gain).
- Lancs S. (59):**—*Vallonia pulchella pulchella* (L. W. Grensted).
- Yorks S. W. (63):**—*Pisidium hibernicum* (G. Fysher).
- Yorks N. W. (65):**—*Pisidium casertanum*, *P. nitidum*, *P. supinum* (G. Fysher).
- Isle of Man (71):**—*Pisidium personatum* (W. H. Heathcote).
- Dumfries (72):**—*Zonitoides excavatus* (E. Crapper).
- Fife (85):**—*Paludestrina jenkinsi*, *Pisidium amnicum*, *P. nitidum*, *P. subtruncatum*, *P. lilljeborgi*, *P. hibernicum*, *P. milium* (E. Crapper).

Perth Mid. (88):—*Anodonta anatina* (E. Crapper).

Forfar (90):—*Paludestrina jenkinsi*, *Pisidium hibernicum* (E. Crapper).

Aberdeen N. (93):—*Pisidium milium*, *P. personatum*, *P. subtruncatum* (F. Booth).

Westernness (97):—*Pisidium casertanum* (F. Booth).

Ebudes Mid. (103):—*Pisidium personatum* (coll. J. W. Taylor).

Ebudes N. (104):—*Pisidium milium*, *P. obtusale*, *P. personatum* (F. Booth).

Ross W. (105):—*Pisidium casertanum*, *P. obtusale*, *P. personatum* (F. Booth).

Limerick (142):—*Pisidium pulchellum* (Dr. Evans).

Planorbis stræmi is like a large *albus*, but there is no spiral striation and the keel is always present and prominent. *Pl. vorticulus* is liable to be mistaken for young *vortex*; the shell is hollow below instead of flat, flatter above than *vortex* and the keel more centrally placed. Doubtful specimens should be submitted for verification.

ANNUAL REPORT OF THE LEEDS BRANCH.

ELEVEN meetings have been held during the year. The six winter meetings were given up to papers and special exhibits. Of the papers contributed two were by Mr. E. Percival, B.Sc., of the Leeds University, one on "Degeneration in the Mollusca as illustrated by Parasitism" and the other, "Some Facts relating to the Development of Anodonta." Most of the matter being an account of original investigations by the lecturer, many new facts were expounded and he was heartily congratulated on the results of his observations. A third paper was contributed by Mr. J. A. Hargreaves on the "Marine Mollusca of the North British Shores." As the lecturer has devoted much study to the distribution of the British Marine Mollusca, the members were treated to an instructive and interesting paper. The special exhibits were *Helix aspersa*, *nemoralis* and *hortensis* and *Helicigona arbustorum*, to show influence of environment, on all of which species Mr. J. W. Taylor, M.Sc., contributed illustrative notes. The summer rambles were more or less failures owing to bad weather. Mr. J. H. Lumb is our President.

F. BOOTH, *Hon. Sec.*

ANNUAL REPORT OF THE LONDON BRANCH.

SINCE the last Annual Meeting, ten monthly meetings have been held. The attendances have been good and the exhibits of great interest.

Notes on the species exhibited have been given by the President, Mr. A. S. Kennard (British Land and Freshwater species), by Mr. A. E. Salisbury (Foreign Marines) and by Col. A. J. Peile (Foreign Land Operculates), whilst Dr. E. W. Bowell has shown microscopical slides of radulæ. One field outing took place in June, under the leadership of Mr. J. E. Cooper, at Colnbrook (Middlesex), where 45 species of mollusca were noticed, including *Vertigo moulinsiana* (Dup.) and *V. antivertigo* (Drap.).

J. C. DACIE, *Hon. Sec.*

ANNUAL REPORT OF THE NORTH STAFFORDSHIRE BRANCH.

FOR individual work done by members of this branch, I must give the palm to Mr. W. E. Alkins, who is still actively carrying out his ecological observations in N. E. Staffs., and is also studying the *Pisidium* fauna of a short length of the Churnet Valley.

He is further engaged with statistical work on (1) *Cl. bidentata* and (2) *Cl. bidentata* x *Cl. cravenensis*. We are looking forward with much interest to the result of this work which is now approaching completion, and has been aided by a grant from The Royal Society.

A strong colony of *Z. excavatus*, all of the greenish-white variety, has been located at Oakamoor (W. E. Alkins).

At or near Cheddleton and Consall, a number of interesting mollusca has been taken, including:—*Vallonia costata*, *Z. excavatus*, *Punctum pygmæum*, *Sphyradium edentulum* and scalariform varieties of *Hygromia hispida* and *Planorbis spirorbis* (J. Hill).

Paludestrina jenkinsi and *Aplecta hypnorum* are recorded from new localities. The latter species was in association with *L. pereger* (B. Bryan).

B. BRYAN, *Hon. Sec.*

523rd Meeting, held at the Manchester Museum, November 7th, 1923.
The President, Mr. J. Wilfrid Jackson, M.Sc., F.G.S., in the chair.

New Members Elected.

Ernest J. H. Waters.

Arthur L. Darrah.

Papers Read.

"The Marine Mollusca of S. Thomé, III," by J. R. le B. Tomlin, M.A.

"*Acanthochites discrepans*, *A. fascicularis*, and *Callochiton lævis* at Chideock," by A. Gardiner.

"Mollusca of Bridport, Dorset," by Giles Owen.

"A Dredging Excursion to Loch Alsh," by H. C. Winckworth and R. Winckworth.

"Non-Marine Mollusca of Port St. Mary, I. of Man," by W. H. Heathcote.

Exhibits.

By Mr. G. C. Spence: *Opeas goodalli* (Miller), from greenhouse, Ellesmere Park, Eccles, Lancs.

By Mrs. Gill: Growth stages of *Pterocera*.

By Rev. L. W. Grensted: *Ariophanta semirugata* (Beck) and *Planispira vittata* (Müll.) from Trichinopoly; also shells from Accra, Gold Coast.

By Mr. J. Wilfrid Jackson: *Paludestrina jenkinsi*, from boating-lake, Belle Vue Gardens, Manchester, and from pond in Dunham Park, Cheshire; *Helicella itala*, from Dove Dale (near Thorpe), Derbyshire; and *Vertigo pygmæa*, from Hope Dale (Alstonfield), Staffs.

524th Meeting, held at the Manchester Museum, December 15th, 1923.

The President, Mr. J. Wilfrid Jackson, M.Sc., F.G.S., in the chair.

Candidate Proposed for Membership.

Evald Holmqvist, c/o Sparbanken, Helsingborg, Sweden (introduced by Berthold Sundler, and J. R. le B. Tomlin).

Resignation.

J. A. Rooth.

Member Deceased.

Lt.-Col. H. H. Godwin-Austen.

Member Struck off the List (Rule iv).

E. W. Jones.

Papers Read.

"Rare Varieties of *Helix hortensis* in Glamorgan," by G. A. Martin.

"The intrusion of Land-shells on some drained lake-beds in the vicinity of Borås, Sweden; with notes on varieties of *Vertigo lilljeborgi*, Westerlund," by B. Sundler.

Zoological Record.

Mr. J. R. le B. Tomlin, M.A., F.E.S., was nominated to represent this Society on the Zoological Record Committee in London.

Principal Exhibits.

By Mr. G. A. Martin:—Specimens to illustrate his paper.

By Mr. E. R. Brown:—A very choice series of *Oliva*, including some of the rarer forms.

By the Manchester Museum:—Two drawers of European *Helices* from a handsome cabinet of land shells recently presented to the Institution by Mr. C. H. Schill.

The special exhibit was *Solarium*.

525th Meeting, held at the Manchester Museum, January 2nd, 1924.

The President, Mr. J. Wilfrid Jackson, M.Sc., F.G.S., in the chair.

New Member Elected.

Evald Holmqvist.

Candidate Proposed for Membership.

Robert Charles Moore, M.A., M.Sc., 25, Galloway Road, Waterloo, Liverpool (introduced by J. W. Jackson and G. C. Spence).

Resignation.

John Morley.

Papers Read.

"Obituary Notice: J. T. Marshall," by J. R. le B. Tomlin, M.A.

"*Helix aspersa* mons. *scalariforme* from Jersey," by R. Standen.

"Description of a new variety of *Cypræa arabica* L.," by W. Gyngell.

"Mollusca of Flamborough," by A. E. Ellis.

Principal Exhibits.

By Mr. R. Standen:—*H. aspersa* m. *scalariforme*, from Gorey, Jersey (coll. C. J. Mogridge) to illustrate his paper; *Cypræa arabica* var. *splendens* Gyngell, to illustrate Mr. Walter Gyngell's paper.

By Mr. A. K. Lawson :—Curious forms of *Limnæa stagnalis*, from Ashley Mill, Cheshire (Sept. 1923); *Clausilia laminata*, from Oversley Woods, Cheshire (July, 1923); *H. arbustorum*, from Castle Mill, Cheshire (Sept. 1922).

By Mrs. Gill :—Growth-stages of *Cypræa mauritiana*.

By Manchester Museum :—Series of *H. pomatia* and *aspersa*, from many localities (Schill collection).

The Special Exhibit was *Cataulus*, on which Mr. G. C. Spence gave an interesting talk.

526th Meeting, held at the Manchester Museum, February 6th, 1924.

The President, Mr. J. Wilfrid Jackson, M.Sc., F.G.S., in the chair.

New Member Elected.

Robert Charles Moore, M.A., M.Sc.

Member Deceased.

Silas C. Wheat.

Mr. Robert Standen's 70th Birthday.

On behalf of the Council and Members Mr. Heathcote moved and Mr. F. Taylor seconded a resolution congratulating Mr. Standen on the attainment of his 70th birthday on January 14th. Mr. Heathcote, who had come specially for this occasion, referred to the very close and cordial associations he had always had with Mr. Standen, having become acquainted with him on his native heath of Goosnargh, near Preston, on January 22nd, 1877. He alluded to the excellent work done by Mr. Standen on behalf of the Society and conchology in general, and to his versatility in other branches of natural history. Mr. Taylor also referred to the many acts of kindness conferred by Mr. Standen upon himself and many others.

Papers Read.

"Mollusca of the neighbourhood of Market Harborough," by A. E. Ellis.

"Notes on some British Helicidæ," by A. E. Ellis.

"*Venus latilirata* Sowerby," by J. R. le B. Tomlin, M.A.

"Some Snails of the Genus *Euhadra*," by Prof. T. D. A. Cockerell.

"Note on the Occurrence of Fossilized Helicoid Casts on the Indian Pearl Banks," by James Hornell, F.L.S., etc.

"A few rough Notes on some British Non-Marine Mollusca from several counties," by W. Gyngell.

"Additional Notes on the Land and Freshwater Mollusca of Sussex," by Maud and Gordon Dalglish.

Exhibits.

By Rev. L. W. Grensted : *Limnæa auricularia* var. *sinuosa* West., and *Planorbis carinatus* from L. Garda.

By Mr. A. E. Ellis : Holocene Shells from Market Harborough.

Income and Expenditure Account.

Life Membership Fund.

BALANCE SHEET.

NOTE.—Assets in addition to those set out in the Balance Sheet are (*a*) Library, (*b*) Cabinets and Collections; (*c*) Stock of unsold Publications; (*d*) Annual Subscriptions in arrear.

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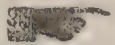
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T H E
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No. 5

THE SIGNIFICANCE OF THE INTESTINAL CONVOLUTIONS
AND SHELL STRUCTURE IN THE GENUS MILAX;
With Remarks upon the Hyperstrophic Inversion.

BY JNO. W. TAYLOR, M.Sc.

(Read before the Society, May 3rd, 1924).

A CAREFUL study of the genus *Milax* exemplifies in a startling way how the evolution and life-history of a species or group may be illumined and explained by a thoughtful contemplation of the structural and relational features of the organism, and a light also thrown upon the different forms the species or group may have assumed during their illimitable past history, while a comparative study of allied groups which are further advanced on the evolutionary path enables us to reveal their probable line of future development.



FIG. 1. — Dorsal aspect of *Milax gagates*, showing the lobate shield, the respiratory orifice and dorsal keel.

The British species of *Milax* are two in number, *Milax gagates* and *Milax sowerbyi*, and though they are so closely allied in structure they differ widely in geographical distribution, *Milax gagates* having an almost world-wide distribution, while its congener is scarcely known beyond the European region. Both species when externally examined appear to be slugs of truly dextral aspect and organization with the organic apertures for the generative, respiratory and excretory functions on the right side of the body, and affording no external indication of the marvellously interesting features which their anatomy discloses. When we come to study their internal structure, we find that it does not correspond with the external features, but shows a complex alimentary system, composed of three or more complicated

intestinal tracts or courses, not dextrally convoluted as is usual in dextral mollusks, but undeniably sinistrally coiled and indicating the

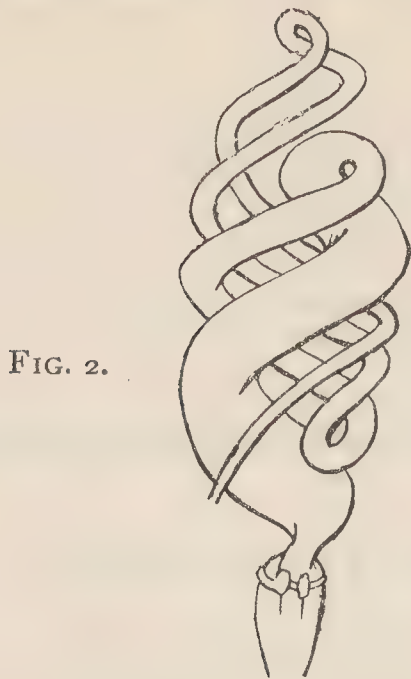


FIG. 2.

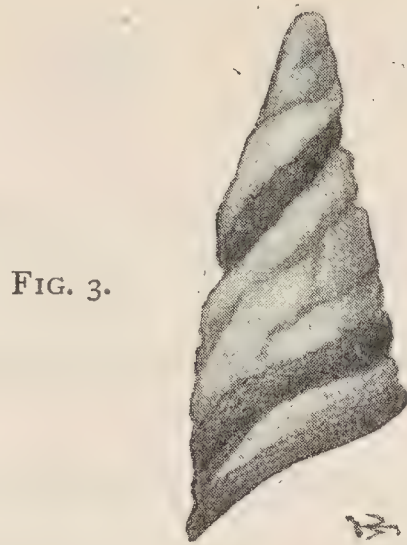


FIG. 3.

FIG. 2.—Intestinal convolutions of the alimentary system of *Milax sowerbyi* enlarged.

FIG. 3.—Caudal extremity of *Milax sowerbyi*, with the integument removed to show the spiral twist of the liver and intestinal tract $\times 2$.

former possession of a sinistrally coiled bulimoid shell, quite out of accord with the external dextral characters.

The flat, white, cretaceous shell is now quite concealed beneath the shield or mantle, but a careful scrutiny and study shows it to be the vestigial remnant of a spiral shell with a sinistral coiling, this being clearly established by the retention and position of the apical structure and the character of the encircling growth-lines.

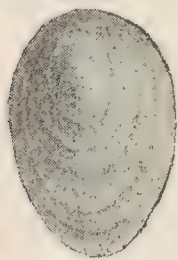


FIG. 4.



FIG. 5.

FIG. 4.--The upper and (FIG. 5) under aspect of the degenerate internal shell of *Milax gagates* $\times 3$.

The true interpretation of this contradictory and anomalous organization clearly indicates that the ancestral form of *Milax* was a dextrally organized animal, bearing a dextrally convoluted shell, and with the genital, respiratory and excretory orifices on the right side of the body as is normal.

In course of time, from causes yet undetermined, but probably due to the elongate shell becoming increasingly cumbrous and unwieldy, the curious phenomenon of hyperstrophy or inversion of the spiral is initiated, this being in effect a vertical reversal of the direction of the coiling of the shell and viscera, and inevitably involving a horizontal transfer from right to left of all the organs of the visceral sac. This is accomplished by a slow and gradual sinking of the apex and spire within the outermost or body-whorl of the shell, which position constitutes the intermediate or planorboid stage; the evolutionary action continuing to persist, the spire gradually emerges and protrudes from what constituted the umbilical region of the shell when dextral, the

remaining whorls are gradually transferred to the opposite side and the shell becomes a hyperstrophic sinistrally convoluted *Bulimus*-like shell of probably three or more whorls, but the external orifice of the generative system is retained on the right side of the body, as the cephalic and pedal areas are quite unaffected by the hyperstrophic changes which the visceral sac and its protective shell have undergone.

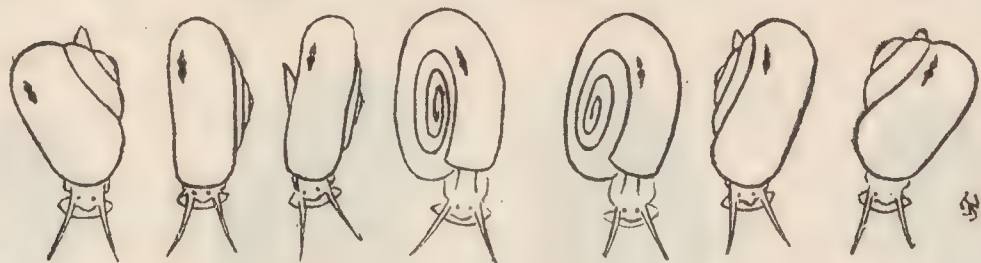


FIG. 6.—Diagrammatic figures showing the probable mode by which an orthostrophic sinistral shell becomes a hyperstrophic dextral one, and how the internal organs become automatically displaced thereby, the heart being shown transposed from the left-hand, basal side of the shell, to the right-hand side of the upper part of the whorl.

On the completion of the hyperstrophic process, the atrophy or degeneration of the shell sets in, and proceeds *pari passu* with a movement for the accommodation of the complex gut, the shell, and the viscera generally, within the body cavity of the developing slug, such a process as is now actually in progress at the present day in *Vitrina*, *Amphipeplea* and other groups.

Eventually the degenerating shell, the rest of the gut and other visceral organs become enfolded within the mantle, the shell gradually assuming the flat and simple form it now possesses, and the mollusk acquires the aspect, form and structure of the *Milax* of the present day.

This deterioration or atrophy of the shell will probably persist until all distinct vestiges of the shell are lost, and as in the case of *Arion ater*, a dense secretion or deposit of cretaceous particles within the outer integument will take place, and eventually result in the formation of a new patelloid shelly protection for the body, and the initiation of a new cycle of shell development for the species and group, but the precise shell form which will result cannot be predicted as this will depend largely upon environment.

Hyperstrophy, which has had such important influence upon the evolution of *Milax*, may be regarded as the partial or incomplete reversal of the coiling of the shell, and when occurring in a dextral species it becomes hyperstrophically sinistral, in which state it is often distinguished as the pseudo-sinistral or ultra-dextral condition, while normally sinistral shells, when in the hyperstrophic dextral state, are known as pseudo-dextral or ultra-sinistral, these terms being used to differentiate those imperfectly sinistral mollusks whose sinistrorsity only affects the visceral sac, the protective shell and its organs, but does not interfere with the cephalic and pedal regions of the body, nor with the external orifice of the generative system, as these are not involved in, or affected by the hyperstrophic changes the visceral sac has undergone.

Hyperstrophic sinistrorsity differs fundamentally from the usual sinistral shells, in that it is due to what we may term a vertical transposition of the spire from the upper side of the shell to the side below, which thus becomes the upper side, and all the contained organs are vertically transposed and in addition also transferred from the right to the left side, in conformity with and in consequence of the change in the shell.

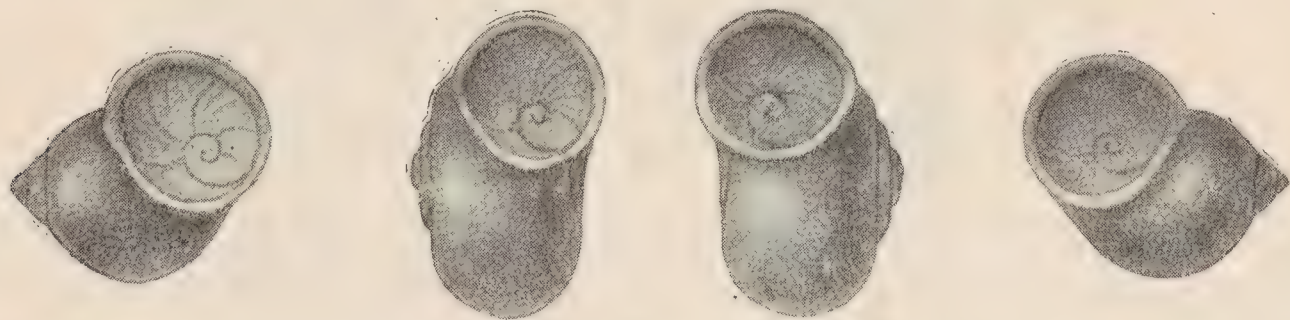


FIG. 7.—Hypothetical figures, illustrating the changes inevitably involved in the reversal of the coiling of the shell by hyperstrophic action, and especially to show its striking influence upon the operculum and how this is brought about.

The operculum when present has been said by Prof. Arnold Lang, Dr. Cooke and other authors, not to be involved in the changes the other organs of the visceral sac have undergone, but to bear its spiral or other structure unchanged in direction.

This statement is, however, not strictly correct, as the operculum though itself remaining practically unchanged, does actually become vertically and equatorially reversed when functioning to close the aperture of the shell, and this is solely owing to the hyperstrophic action which the shell and visceral sac have undergone. Although the spiral opercular structure continues to be sinistral, yet its position in regard to the shell is materially altered, for while the direction of the opercular coiling of a dextral shell is an *ascending* spiral springing from the *lower left* hand margin of the operculum, that of a hyperstrophic sinistral shell bears a *descending* spiral, originating from the *upper right* hand margin, or exactly opposite to that of the operculum of the dextral shell.

The true and completely sinistral shells differ essentially from those hyperstrophically sinistral, in that the reversal in the position of the organs of the animal affects the entire organism, but only in the lateral



FIG. 8.



FIG. 9.



FIG. 10.

FIG. 8.—A dextrally coiled operculate gastropod shell, with a normal sinistrally coiled operculum.

FIG. 9.—A hyperstrophically sinistral operculate shell, which shows that the spiral coiling of the operculum now originates from the upper right hand margin, has a descending direction and has been transferred from the left to the right hand side.

FIG. 10.—An ordinary or complete reversal (non-hyperstrophic) of coiling for comparison with Fig. 9.

or horizontal direction. This transverse reversal is liable to occur sporadically in any species, and appears to originate and become perceptible at the third segmentation of the fertilized germ-cell. The hyperstrophic or vertical transposition of the organs of the body is, on the contrary, the outcome of an excessively slow and very gradual evolutionary action extending over innumerable generations and vast periods of time.

All groups and all individual organisms, whether belonging to the same or to diverse genera, are far from being equally responsive to the same evolutionary influence, or to the same environment, for while the more receptive organisms will advance in their organization, or progress in their adaptability to a changed environment, others will remain practically stationary, while a few will undergo a retrogressive course and will degenerate by their adoption of some less active mode of life.

Viewed in this light it is possible that some of the laggard forms of the Milaces may still exist and linger in some very remote and distant country, possibly as inhabitants of some oceanic islands, or may even be found in some bleak, barren, or other inhospitable ground nearer home.

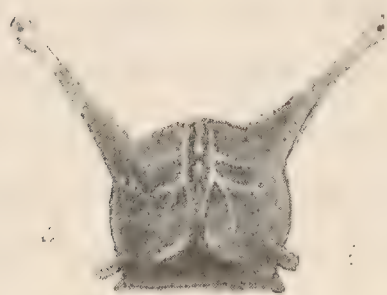


FIG. 11.

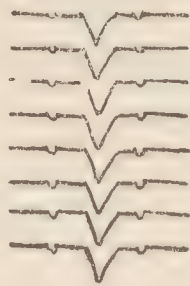


FIG. 12.



FIG. 13.

FIG. 11.—Facial grooves characteristic of *Milax sowerbyi* $\times 2$.

FIG. 12.—Median longitudinal area of foot-sole of *Milax sowerbyi*, to show the transverse chevroniform structure $\times 2$.

FIG. 13.—Spermatophore of *Milax sowerbyi* $\times 8$, to show its remarkable crozier-like form.

Such a discovery would be of intense interest, and in the hope that in such an event they would be useful in the efforts to establish relationship, I figure three characteristic features, the facial grooves or furrows, the remarkable structure of the median area of the foot-sole, and the very peculiar spermatophore, in the belief that they are more permanent characters in this group than the very unstable shell.

NOTES ON SOME MACTRIDÆ.

BY J. R. LE B. TOMLIN, M.A.

(Read before the Society, April 5th, 1924).

IN the 63rd volume of the *Journal de Conchyliologie* Dr. Lamy published a Revision of the Recent Mactridæ in the Paris Museum, which is practically a comprehensive monograph of the family. The consideration of this valuable paper has suggested the following notes—which have also been amplified by an examination of the material in the British Museum.

Reeve in his monograph of *Mactra* in the *Conch. Icon.*, vol. viii, ascribes 56 species to Deshayes, as well as a *Mactra tenera* Desh. which is queried as a synonym of *anatinoides* Rve. and of which nothing further is known. Of these 56 the following 10 were never described at all by Deshayes and must be credited to Reeve:—*apicina*, *cordiformis*, *dysoni*, *epidermia*, *gibbosula*, *incarnata*, *mitis*, *semistriata*, *semisulcata* and *subrostrata*.

Both authors describe a *bilineata* C. B. Adams MS. which must also stand as Reeve's species, as his has nine months' priority. Deshayes' species were all published in the Proc. Zool. Soc. London for 1853 and 1854. It is, however, well-known that these nominal dates do not by any means represent the time of publication. This, in the middle of last century, got very much behind and a comparison of dates shows that in every case Reeve must stand as the author. The following table gives the respective dates. It should be noted that *aequilatera* Rve. is equivalent to *aequilateralis* Desh., and *cumingii* Rve. to *cuvieri* Desh. Both these names of Deshayes fall in synonymy. The nos. are those of the figures in Reeve's *Mactra*.

		REEVE.	DESHAYES.
<i>aequilatera</i>	14	... March, 1854	... 13 July, 1854 (<i>aequilateralis</i>)
<i>angulifera</i>	83	... May, 1854	... 10 February, 1855
<i>angusta</i>	93	... „	... „
<i>aphrodina</i>	105	... „	... 10 January, 1855
<i>attenuata</i>	97	... „	... „
<i>californica</i>	114	... „	... 10 February, 1855
<i>capillacea</i>	117	... „	... „
<i>carinulata</i>	38	... April, 1854	... „
<i>complanata</i>	54	... „	... 27 June, 1854
<i>contraria</i>	86	... May, 1854	... 10 January, 1855
<i>corbiculoides</i>	98	... May, 1854	... „
<i>corbuloides</i>	103	... „	... „

		REEVE.	DESHAYES.
<i>cornea</i>	75	... „	... 27 June, 1854
<i>cumingii</i>	24	... April, 1854	... 13 July, 1854 (<i>cuvieri</i>)
<i>decora</i>	80	... May, 1854	... 10 January, 1855
<i>dissimilis</i>	59	... April, 1854	... „
<i>dolabrata</i>	107	... May, 1854	... 10 February, 1855
<i>egena</i>	71	... April, 1854	... „
<i>eximia</i>	31	... „	... 27 June, 1854
<i>explanata</i>	70	... „	... 10 February, 1855
<i>hepatica</i>	110	... May, 1854	... 10 January, 1855
<i>inæqualis</i>	87	... „	... „
<i>incongrua</i>	100	... „	... „
<i>luzonica</i>	81	... „	... „
<i>mera</i>	82	... „	... 27 June, 1854
<i>meretriciformis</i>	18	... March, 1854	... „
<i>murchisoni</i>	76	... May, 1854	... 10 January, 1855
<i>obesa</i>	19	... March, 1854	... 27 June, 1854
<i>opposita</i>	95	... May, 1854	... 10 February, 1855
<i>pellicula</i>	124	... „	... „
<i>plicatilis</i>	121	... „	... „
<i>pura</i>	53	... April, 1854	... 27 June, 1854
<i>quadrangularis</i>	3	... „	... „
<i>radiolata</i>	91	... May, 1854	... 10 February, 1855
<i>reevei</i>	85	... „	... 27 June, 1854
<i>rostralis</i>	119	... „	... 10 February, 1855
<i>scalpellum</i>	106	... „	... „
<i>sericea</i>	10	... March, 1854	... „
<i>silicula</i>	108	... May, 1854	... „
<i>sublanceolata</i>	74	... „	... „
<i>sulcataria</i>	5	... March, 1854	... 27 June, 1854
<i>symmetrica</i>	84	... May, 1854	... 13 July, 1854
<i>transversa</i>	88	... „	... 10 February, 1855
<i>tristis</i>	69	... April, 1854	... „
<i>veneriformis</i>	2	... „	... 27 June, 1854
<i>virgo</i>	63	... „	... 10 February, 1855

Four species described by Deshayes do not occur in Reeve, viz. :—*intuspicta*, *bullata*, *hiantina* and *goniata* (given as of Gray MS.).

The following synonymy is mainly additional to, or confirmatory of that given by Lamy :—

<i>Mactra carinulata</i> Rve.	= <i>Mulinia guadelupensis</i> Récluz, not <i>M. pallida</i> Brod. & Sow. as Lamy gives.
<i>M. semisulcata</i> Rve.	= <i>Mactra olorina</i> Phil.
<i>M. reevei</i> Rve.	= <i>Mactra maculata</i> Gmel.

<i>M. meretriciformis</i> Rve.	=	<i>Macra abbreviata</i> Lam.
<i>M. radiolata</i> Rve.	=	<i>Macra lurida</i> Phil.
<i>M. intuspicta</i> Desh.	=	<i>Macra lurida</i> Phil.
<i>M. californica</i> Rve.	=	<i>Macra deshayesi</i> Conrad
<i>M. corbuloides</i> Rve.	=	<i>Spisula trigonella</i> Lam.
<i>M. cretacea</i> Angas	}	<i>Spisula trigonella</i> Lam.
<i>M. fluviatilis</i> Angas		
<i>M. producta</i> Angas		
<i>M. hiantina</i> Desh.	=	<i>Macra fragilis</i> Gmel.
<i>M. bilineata</i> (C. B. Adams MS.)		
Rve.	=	<i>Macra fragilis</i> Gmel.
<i>M. cordiformis</i> Rve.	=	<i>Macra turgida</i> Gmel.
<i>M. mariæ</i> A. Ad.	=	<i>Macra elongata</i> Q. & G.
<i>M. complanata</i> Rve. non Gmel.	=	<i>Macrinula chionia</i> Tomlin
<i>M. delicatula</i> Preston	=	<i>Macra cuneata</i> Gmel.
<i>M. taprobanensis</i> Preston	=	<i>Macra lilacea</i> Lam.

For the well-known *M. hians* Phil. non Pult. the name *rochebrunei* Lamy must be used.

Lamy mentions this name in synonymy and notes the fact that *hians* is preoccupied, but nevertheless allows the latter to stand.

M. sauliana Gray. Reeve seems to have been the first to pervert this name to *sauliæ*, and Hanley was equally careless in recording it as *saulii*. Lamy, however, after giving *sauliana* Gray as the first published name, deliberately employs the later *sauliæ*. There is at present among some continental authors a deplorable tendency to tamper with the terminations of both geographical and personal specific names, apparently in a pedantic attempt to bring them into conformity with classical usage. In a recent and otherwise admirable work entitled "Faune Malacologique . . . des Iles Mascareignes" Dr. Germain has thus arbitrarily altered no less than 25 such names, the net and only result being the creation of 25 unnecessary synonyms. No protest can be too vigorous against this unjustifiable practice.

The following species of *Lutraria* are also affected in the same way. The nos. are those of Reeve's *Lutraria*.

		REEVE.	DESHAYES.
<i>arcuata</i>	6	... August, 1854	... 10 February, 1855
<i>australis</i>	12	... "	... "
<i>curta</i>	5	... "	... "
<i>dissimilis</i>	8	... "	... "
<i>impar</i>	10	... "	... "
<i>philippinarum</i>	4	... "	... "
<i>sieboldtii</i>	15	... "	... " (<i>sieboldii</i>)

H. aspersa var. **major**.—Records of this variety have been made very loosely, dimensions rarely being given. By far my largest average specimens I took, in company with Mr. H. Beeston, on a rough grassy hillside near Buriton, in May, 1920. Shells having a diameter of 40 mm. were not uncommon. I found a colony of extra large individuals among Coltsfoot on the cliffs near South Shields, and another colony on an undercliff just above tidemarks at Cloughton, Yorks., where Scurvy-grass was the main food. Single shells measuring 39 mm. have been taken at Malton by Mr. C. C. Laverack and by myself at Scarborough. The most beautiful and varied forms I know occur in a favoured spot near Scarborough; ponderous shells weighing up to 96 grains and colour vars. from *nigrescens* to *lutescens* are associated with the most delicately marked *flammea*. Most of the named vars. of this species are very indefinite, though no one could say this of choice examples of *exalbida* and *nigrescens*. The var. *unicolor* I have only taken in the south of England.—W. GYNGELL (*Read before the Society*, Feb. 6, 1924).

Paludestrina jenkinsi in Fife and Forfar.—I have to report further occurrence of this shell in two new stations in the Tay area. These are:—(1) Chisel Burn, Tayport, Fife, 17/6/20; (2) Stagnant Pool, Magdalen Green, Dundee, Forfarshire, 24/3/21. Lot No. 1, from the Chisel Burn, were taken exactly at the mouth thereof, where it empties its waters over the mud-flats at Tayport. This burn is similar in every respect to Lundin Burn, whence I took *P. jenkinsi*, and is situated only a few score yards from that burn. The second record is of greater interest in that the habitat differs considerably from all the other stations already reported from this district. These were taken in a small and evil-smelling stagnant pool, about 25yds. by 50 yds. in extent, in a remote corner of Magdalen Green, one of the public open spaces in Dundee, which has neither visible inlet nor outlet. Undoubtedly many years ago this “pond” formed part of the very large expanse of mud-flats which then existed at this point of the Tay, but now-a-days some 200-300 yards of reclaimed land stretch between the river and this pond, besides which the Dundee to Perth railway traverses this reclaimed land and acts as a complete barrier between the river and the pond, and as this railway was opened in 1847, we must suppose this pond to have been isolated since at least that time. We must also suppose *P. jenkinsi* to have been in existence at this place since that date. An alternative explanation of its occurrence here now might be found in the presence of several Water-hens which make this pool their home, as it is quite possible that *P. jenkinsi* may have been carried by them to this pool, in pretty much the same fashion as was recently brought to light by Mr. Coates, of Perth, when he reported to this Society that shells of this species and of *Pisidium subtruncatum* were found adhering to the bill of a Scaup Duck shot at Perth. Be that as it may, I consider the occurrence of this shell in this pool of particular interest, completing as it does the presence of *P. jenkinsi* in each of the four Vice-County Areas within the Tay Basin Area, namely:—Perth Mid., Perth East, Forfar and Fife. I am indebted to Mr. Oldham of Berkhamsted for identifying these two lots of shells for me. Specimens have been forwarded by him to Prof. Boycott for inclusion in the Census records.—E. CRAPPER (*Read before the Society*, Dec. 6th, 1922).

SOME NEW VARIATIONS OF SLUGS.

BY FRIDTHJOF ÖKLAND.

(Read before the Society, May 3rd, 1924).

SLUGS, so little attractive to most zoologists because of their slimy appearance, often present most interesting colour variations, which, however, need to be studied in the living animal. The multitude of colour variations presented by several species has only in a few cases been the subject of genetic studies. Nevertheless we must endeavour to obtain as detailed knowledge as possible of the existing variations. There will here be described some new Scandinavian forms. The types are preserved in the Zoological Museum, Kristiania.

***Limax cinereo-niger* Wolf var. *cinereo-viridis* nov.**

Ground colour of the upper side greyish green, except the shield, which is almost entirely black. The green component of the colour is not very conspicuous in the living animal and disappears in alcohol.

LOCALITIES.—Lærdalsören in Sogn, Norway, and at Hamre by Hudiksvall, Sweden.

DESCRIPTION.—On the 18th of June, 1923, I found a specimen of *L. cinereo-niger*, 14 cms. long, which differed from the known colour variations of the species. Behind the black shield the ground colour was dark grey, faintly tinged with green. The median line was whitish, and the anterior half of the body had on each side indications of a pale longitudinal band. In the hinder third of the body there were, close to the whitish keel, some very small oblong spots of a darker colour. The outer areas of the sole were pigmented. One specimen of *L. cinereo-niger* (s. str.) was found close by.

Another specimen of this new variety I collected in the neighbourhood of Vikarsjön at Hamre, some seven kilometres from Hudiksvall in Northern Sweden, on the 24th of July, 1923. It measured about 15 cms. when fully extended, and was considerably paler than the slug already described, the shield presenting the darkest pigmentation. The whitish, faintly green colour of the keel could not be traced forwards to the shield; there were no indications of pale lateral bands. Close to the pale keel I noticed a single, sharply pigmented point and a quite diffuse pigmentation. The lateral parts of the foot sole were grey. No other variations of the species were found in the neighbourhood.

As type I have chosen the specimen from Lærdalsören. This new variety of *L. cinereo-niger* bears some resemblance to var. *atroviridis* Ökland (vide p. 112)¹ and var. *calosoma* Eisen et Stuxberg. The

¹ "Aandulsnes" is a printer's error for "Aandalsnes."

ground colour of the former is obscure olivaceous, totally different from the faint green in var. *cinereo-viridis*. According to the original diagnosis, combined with those given later on by Westerlund (1873, p. 596, and 1897, p. 27), var. *calosoma* has the following aspect: shield black with pale edges, back obscure olivaceous with greyish green keel, sides olivaceous with greyish green spots, foot-fringe bluish grey, outer areas of the foot-sole grey. This peculiar variety is only known from Gotska Sandön in the Baltic.

It will be a matter of opinion how the mutual relation between these three forms should be expressed in the systematic terms. I designate them as separate varieties, but later on intermediate forms will perhaps be found, showing a closer relation than that here assumed.

***Limax tenellus* Müller ab. *alba* nov.**

Pure white, only the eyes with black pigmentation.

LOCALITY.—Stamnes, Alstenö in Northern Norway, 66° N.L.

I never saw the description of a pure white *Limax tenellus*, although Simroth (1910, p. 321) from the Alps mentions an adult specimen which was deficient in yellow colour, but as no complete description is given, very likely the dark pigmentation of the head was present.

The specimen measured two centimetres, and was found on the 20th of August, 1923, east of the rectory of Stamnes, in a wood of birches (*Betula odorata*). In formalin it has turned to a light greyish colour.

When dissected, no indication of a cœcum was to be seen, yet confusion with an albinoid young of *Limax cinereo-niger* must be put out of the question, as the living slug had the shape and consistency of *Limax tenellus*. The reproductive organs proved to be very little developed, a fact which I am inclined to connect with its albinism. This faint development of the reproductive organs, together with the practically total absence of pigment, gives the specimen a pathological touch. Consequently, I name it an aberration, not variety, in accordance with Plate (1914, pp. 134-135 and 142). In a previous paper (Ökland, 1922, pp. 37-38) I described an aberration of another slug, *Arion circumscriptus* ab. *flava*, which in a similar way and still more conspicuously, answers to the definition of an aberration given by Plate: "eine seltene, stark abweichende Variation, häufig mit patholog. Anstrich."

In Stamnes no other species of *Limax* were found, but in the southern part of the island of Alsten normal *L. tenellus* proved to occur as well as *L. cinereo-niger* (s. str.) and *L. arborum*.

Arion ater (L.) var. **alba** L. subvar. **aberrans** nov.

White or whitish, foot-fringe orange, head, especially the upper tentacles, black.

LOCALITY.—Skjolden in Sogn, Norway.

The variations of *Arion ater* presenting a white or whitish ground colour are united in the var. *alba*. However, the head, especially the tentacles, and the foot-fringe, may have other colours, and accordingly the following sub-varieties have been distinguished:

sub-var. *simplex* Moq., uniformly white or whitish.

„ *elegans* Moq., head and foot-fringe orange.

„ *marginata* Moq., foot-fringe orange.

„ *oculata* Moq., head, especially the tentacles, black.

The largest of the five specimens observed had a faint greyish tinge, while the others were white. Fixed in alcohol the largest, which I have chosen as type, measures 6.5 cms.; fully extended it would have a length of at least 8 cms. In the same locality was found *alba elegans*, but no other forms of *Arion ater*.

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OBITUARY NOTICE: LIEUT.-COL. H. H. GODWIN-AUSTEN,
F.R.S.

By J. COSMO MELVILL, D.Sc.

(Read before the Society, April 5th, 1924).

HENRY HAVERSHAM GODWIN-AUSTEN, whose demise is much deplored, had long passed the normal age of man, but to the last preserved his clear and accurate powers of mind, and seemed much younger than he really was. Born July 6th, 1834, he was the eldest son of a large family, his father, Mr. Robert Alfred Cloyne Godwin-Austen, F.R.S., of Shalford Park, near Guildford (who married Maria, daughter of General Godwin, C.B., and by Royal license added her patronymic to his own) was a very distinguished geologist, and the son therefore possessed hereditary talents of no mean order. Educated at Sandhurst, he entered the army in 1851, and was gazetted to the 24th Infantry Regiment.

Very shortly afterwards, in 1852, he set foot in India for the first time, that Empire being destined to benefit much by his presence there, owing to his untiring energy, vigorous constitution, and scientific bent of intellect. He first gained prestige for his conduct during the Burmese War, and subsequently (in 1857) was appointed an Assistant in the Trigonometrical Survey of India, where his latent powers at once found full vent. At first his attention was directed towards the N.W. Himalayas, Kashmir, Baltistan, etc., and he was one of the first to study the configuration of the glaciers and lofty peaks of that hitherto untrodden range. Amongst his more important discoveries may be mentioned the Baltoro glacier in 1861-62. This issues from the second most lofty mountain in the N. Himalayan range, known and mapped under the description of K² for years by the Royal Geographical Society, but later christened Mount Godwin-Austen. It is hardly 700 feet lower than Everest, at present so much before the public eye, being 28,270 feet altitude.¹

During the following years, 1863 and onwards, he thoroughly explored the almost unknown country about Ladak, and subsequently still further afield, to the Chinese Frontier; he was stopped at Lhasa, and not allowed by the Thibetan authorities to proceed further. Soon after this an émeute took place at Bhutan, when he gained a military honour and decoration, having captured two forts from the enemy. Later on, up to 1876, he continued in very successful projects and surveys, mainly in Assam, among the Naga Hills, and Khasia, and

1 *Vide* Godwin-Austen in Journ. Asiat. Soc. Bengal, 1867-1875.

during this time joined in another expedition against the Dafla Tribes in the Eastern Himalaya, at the same time having been able to fix the exact position and altitude of several peaks and ranges, hitherto only obscurely mapped out.

He received the Royal Geographical Society's Founders' Medal in recognition of such important work.

After his retirement he returned to England, and devoted himself to scientific literary work, especially amongst the Pulmonate Mollusca of the Family Zonitidæ, mainly anatomical.

Amongst other of his studies he was much interested in the Fauna of S. Africa, and Mr. J. Ponsonby-Fane and I, who were from 1890-1909 engaged in describing many new species of the Land Mollusca of that country, had much correspondence with him, especially from 1908-12. He cleared up much that was uncertain from the systematic knowledge only so far obtained, and created several new genera and species, especially among the Helicarionidæ, e.g., *Peltatus*, *Kerkophorus*, *Andrarion*, etc., and his collaboration with us was of the greatest help possible.

His "magnum opus" was doubtless

"The Land and Freshwater Mollusca of India." London, 1882-1910. And likewise "The Fauna of British India—Mollusca." London, 1908.

I append a catalogue of most of his Papers on recent Mollusca (Terrestrial and Fluvial), which show his energetic versatility.

He died last December (1923) at his residence, Nore, Godalming, Surrey, in his 90th year.

He was a Fellow of the Royal, the Zoological, Geological, and the Royal Geographical Societies.

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[This contains many *Cyclophoridæ* and other operculates, such as *Alycæus*, *Diplommatina*, and the fine *Opisthostoma grandispinosum*.]
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Crepidula fornicata (L.) in Dorset.—I have recently learnt that Miss Berens, of Studland, picked up an old shell which I have seen, in Studland Bay previous to 1920. No date has been kept of the finding, but I understand this was made before 1914. Miss Berens is, therefore, the discoverer of this species in Dorset. Shortly after my ¹ note appeared I received a communication from Miss Jewell, stating that *C. fornicata* was abundant on the oyster beds in Emsworth Harbour, the probable source of the shells my brother found at the mouth of Langston Harbour. Miss Jewell, who very kindly sent me a number of specimens dredged from the former locality, informed me that to the best of her recollection the species was first noticed on the beds about 1912. The animals were attached one on top of the other in groups of 4, 5, 7, 10 and 12. Since 1920, I have collected in Studland Bay twelve specimens, all living with one exception, ranging from about $\frac{1}{4}$ to 2 ins. in length, attached to old shells of *Buccinum undatum* and valves of *Mytilus edulis* and *Mactra solida*. From this it would seem conclusive that *C. fornicata* is not on the beds outside Poole Harbour.—T. EDWARD BELCHER.

MOLLUSCA OF THE WILKINS AUSTRALIAN ISLANDS
EXPEDITION (1923).

BY J. R. LE B. TOMLIN, M.A.

(Read before the Society, April 5th, 1924).

THOUGH the number of species in this collection is very small, there are several interesting points about them which make it worth while to give an annotated list. The material has all been added to the Brit. Mus. collections.

Acanthopleura spinigera Sowerby.—One only of this species, collected at Cape Grenville, York Peninsula, in August, 1923. The spines on the girdle are to a great extent abraded. As far as one can judge the specimen corresponds most closely to fig. 39 on pl. 50 of the *Man. Conch.*, vol. xiv.

Cypræa arabica L.—A curiously long and narrow example (living) from the same locality as *A. spinigera*. In form it is comparable with *scurra* rather than with *arabica*, measuring 44 mm. by 25 mm., whereas a typical *arabica* measures about 55 × 34 mm. I have no doubt, however, from its other characters that it should be assigned to *arabica*.

Turbo intercostalis Menke.—Living, from the same locality. The operculum is very convex on the outer side, covered with flattish granules which are rather widely spaced.

Monodonta labio L.—From the same locality.

Vivipara essingtonensis Frauenf.—A very long and rather variable series labelled "Alice Downs, Blackall, Central Queensland, from bore-water, December, 1923."

There is considerable variation in the banding, in the size of the umbilicus and in the convexity of the whorls, so that the sutures appear much more deeply impressed in some shells than in others. The series shows such a complete grading from one extreme to the other, that I think it would be futile to try and split it up.

Rhytida ptychomphala Pfr.—Near Townsville, 19.9.23.

Thersites (Hadra) bipartita Fér.—A fine series of live handsome specimens from Cape Grenville, including two of a uniform light yellow which are the f. *unicolor* of Cox. The colouring of the upper half of the last whorl varies from light yellow to different shades of red-brown.

There is also a single specimen from near Townsville, 19.9.23, very much smaller and more depressed, with an almost uniform colouration

of chestnut-brown shading off into lighter red on the base. This shell has a maximum diameter of 38 mm., as against an average of about 70 mm. in the Cape Grenville shells. Pilsbry mentions a form which only measures 31 mm.

Acanthochites discrepans (Brown), *fascicularis* (Linné) and *Callochiton lævis* (Montagu) at Chideock, Dorset.—As the Jurassic headland, known as the Golden Cap, has receded owing to the inroads of the sea upon its softer strata, it has in past years deposited semicircles of its harder rock in the form of great breakwaters, resulting in the formation in one case of a lagoon which always contains some water, its level being many feet above that of low water. In other cases there are creeks close to the cliffs, empty at all events at low water of spring tides. These are bounded on their outer side by the same kind of boulders as the lagoon. In these positions I found during August and September of last year the three above species of Chiton, with vast numbers of *Craspedochilus cinereus* (Linné). The above formation is interesting in affording many conditions of extreme low tide at a very short distance down the beach, Laminaria and other Algæ of the more distant portions of the littoral zones occur, and the organisms enjoy protection from the heavy seas which render this part of the coast rather poor in life as a whole. I noticed that the two species of *Acanthochites* frequent the edges of the lower sides of stones much covered with algal growth and hydrozoa; the result of this condition and the animals' bristly nature was very perfect protection. The smooth *lævis* and *cinereus* on the other hand preferred clean flat stones, and were right underneath these, their colour closely matching that of the particular stones which they had selected. These colours ranged from black to light red. There are many Cornish records for *discrepans* but these require confirmation. I failed to find it during six years' residence in the county. Mr. R. Winckworth dredged it at Bembridge, Isle of Wight, in considerable numbers, I did the same last April. This habitat is given in the Victoria History of Hampshire. Mr. Winckworth has also taken single specimens on three different occasions at low water at Brighton (*J. of C.*, 1920). In the Channel Islands it is common both on shore and dredged. The British type locality, Tenby, is possibly an error. Both at Bembridge dredged, and in shore at Chideock, the two species of *Acanthochites* are associated.—ALAN GARDINER.

MOLLUSCA OF FLAMBOROUGH.

By A. E. ELLIS.

(Read before the Society, January 2nd, 1924).

DURING a short stay at Flamborough in August, 1923, I made a few notes on the local mollusks which may be of some interest. Very probably the fauna of the district has previously been studied by others, but I have not been able to find any reference to the mollusks of "Little Denmark." My list is as follows :—

In a marsh draining into the sea at the cove known as "Little Thornwick," and extending to within a few yards of extreme high water mark, were :

Agriolimax agrestis.

A. lævis.

Polita cellaria.

P. alliaria (shells of a dull, rather waxy appearance, resembling *P. nitidula*).

P. nitidula.

Zonitoides nitidus.

Euconulus fulvus.

Arion ater (type and var. **marginella**).

A. intermedius.

A. circumscriptus.

Cochlicopa lubrica.

Clausilia bidentata.

Cepæa nemoralis the following varieties, the numbers of each variety are given ; 70 specimens were collected :

var. **libellula**, 00000, 3 specimens ; *albolabris* 00000, 3 specimens ; 12345, 11 specimens ; (123)(45), 8 specimens ; 1(23)45, 1 specimen ; (123)45, 3 specimens ; (12)3(45), 3 specimens ; :2345, 2 specimens ; :234:, 1 specimen ; 02345, 1 specimen.

var. **rubella**, 00000, 24 specimens ; (12345), 3 specimens ; 12345, 1 specimen ; (123)(45), 5 specimens ; (12)3(45), 1 specimen.

Succinea putris (none exceeding 8 mm. in length of shell).

S. elegans (in wetter places than its congener ; attaining a size of 13.5 mm. in length of shell, but usually about 9 mm.).

Hygromia hispida.

The chief plants of this marsh were *Juncus obtusiflorus*, *J. gerardi*, *Phalaris arundinacea* and *Hypnum*.

The following colonies of *Cepæa nemoralis* were noted, and the actual number of each variety counted :

At the base of the cliffs where the Dane's Dyke opens on to the beach on the south of the Head, just above high water mark of spring tides, in company with *Helicella itala* (and var. *hyalozonata*) and *Hygromia striolata* (a smaller race than those found further from the sea), and congregated chiefly on *Centaurea scabiosa* :

var. **libellula**, 00000, 14 specimens ; 12345, 16 specimens ; (123)45, 1 specimen.

var. **rubella**, 00000, 15 specimens ; 12345, 6 specimens ; 123(45), 1 specimen.

On the cliffs at Flamborough Head :

var. **libellula**, 00000, 61 specimens ; 12345, 26 specimens ; (123)(45), 10 specimens ; (12)345, 6 specimens ; (12)3(45), 3 specimens ; 1(23)45, 1 specimen ; 1:345, 1 specimen ; 000:0, 6 specimens.

var. **rubella**, 00000, 20 specimens ; 12345 (including two *albolabris*) 14 specimens ; 123(45), 1 specimen ; (123)(45), 16 specimens ; (12)345, 7 specimens ; (12)3(45), 1 specimen ; 10345, 1 specimen ; ::::, 1 specimen ; 000:0, 1 specimen.

In a ditch by the side of the Bempton Road, along about 50 yards on the east side of the road :

var. **libellula**, 00000, 10 specimens ; (12345), 5 specimens ; (123)(45), 8 specimens ; 123(45), 1 specimen ; (12)3(45), 4 specimens ; 12345, 3 specimens ; 02345, 2 specimens ; 0:::0, 1 specimen, 0(23)(45), 1 specimen.

var. **rubella**, 00000, 17 specimens ; (12545), 1 specimen ; 123(45), 1 specimen ; 12345, 2 specimens ; 02345, 1 specimen ; 12045, 1 specimen ; 0(23)(45), 1 specimen ; :2345, 2 specimens ; :23(45), 1 specimen.

On the cliff top at Gull Nook, chiefly on *Heracleum* and amongst the grass :

var. **libellula**, 00000, 5 specimens ; 12345, 14 specimens ; *albolabris*, 12345, 1 specimen ; (12345), 2 specimens ; 123(45), 2 specimens ; 1(23)45, 3 specimens ; (123)45, 2 specimens ; (123)(45), 4 specimens ; (12)3(45), 2 specimens.

var. **rubella**, 00000, 4 specimens ; 12345, 6 specimens ; (12345), 2 specimens ; (123)(45), 4 specimens ; (12)3(45), 1 specimen ; 12045, 1 specimen.

By the roadside just outside the village of Flamborough :

var. **libellula**, 00000, 1 specimen ; 12345, 3 specimens ; 123(45), 1 specimen.

var. **rubella**, 12345 (including one *roseolabiata*), 5 specimens.

Cepæa hortensis does not appear to occur at Flamborough, but is abundant on the cliffs at Speeton, on *Heracleum*. The ordinary five-banded form, and one specimen of var. *roseolabiata* (12)3(45), all

with the periostracum—except in young individuals—much worn, were the only varieties present. In the same locality were the following forms of *C. nemoralis*:

var. **libellula**, 12345, (123)(45), (12345), 1(23)45.

var. **rubella**, 12345, (123)(45), (12345).

Arianta arbustorum was also abundant on *Heracleum* on the cliffs at Speeton and Bempton; only the type was present.

Helix aspersa was a common species in sheltered nooks along the cliffs in the neighbourhood of the Head, and in the hedges near the village. The variety *flammea* occurred sparingly. The ground-colour of all the shells is of a markedly reddish tinge. Along a length of about 20 yards of hedge-bank on the east side of the road leading to the South Landing there was a large and sharply defined colony of snails, somewhat less than half of which were of the variety *lutescens*. This snail delights in a shower, but always retires during prolonged rain, and is rarely active between noon and 7 p.m.

There was a localised colony of *Theba cantiana* in the hedge near the seaward end of the road to the North Landing, on the north-west side of the road. This snail also occurs in a quarry near Bempton. It is very hard to find in dry weather, but comes forth in great force after a shower.

Hygromia hispida occurred sparingly on the hedge-banks near the village, of smaller size and narrower umbilicus than those in the marsh at Little Thornwick.

H. striolata was one of the commonest species in the ditches and on the roadsides around the village. Most of the specimens were of the form *albocincta*. It is active only in wet weather, and seems more tolerant of prolonged heavy rain than most snails.

Pyramidula rotundata I found very rarely on the cliffs, in hollows of the ground.

Helicella virgata was a very prominent member of the Flamburian fauna. On the Head both the banded form and var. *lutescens* were very abundant, congregating especially on the sea mayweed (*Matricaria inodora maritima*); the shells of these specimens lacked the purplish tinge which characterised those of more inland specimens, particularly of *lutescens*, and were often much bleached, *lutescens* being more liable to loss of colour than the normal form. Along the sides of the Bempton Road the species was common, and of small size. In dry grassy places away from the sea, such as roadsides and borders of fields, the type, and the varieties *lutescens* and *albicans* were all very conspicuous, resting most of the time on the grass stems; these had shells suffused with purple in the region of the aperture.

None of the more inland specimens were so large as some of those from the cliffs. The largest shell I have from the latter locality is a *lutescens* 16 mm. in diameter. After rain these snails covered the heaps of cut grass by the roadsides in swarms. They rarely conceal themselves, like *H. caperata*, in the day.

Helicella caperata forms a colony on a steep bank on the north side of the Bridlington Road just within the parish boundary. It also occurs, with the variety *ornata*, in a quarry near Bempton. This snail seems more sensitive to drought than *H. virgata*, and was never abroad after 10 a.m. until the evening,

In a dry stream-bed at the South Landing, amongst *Apium nodiflorum*, in company with *Polita cellaria*, occurred a few small specimens of *Limnæa pereger*.

Arion ater was quite a frequent inhabitant of the cliff-tops in the neighbourhood of Flamborough Head.

In the quarry near Bempton mentioned as being inhabited by *Theba* and *Helicella caperata*, occurred amongst moss *Lauria cylindracea*.

On the rocks above high tide mark, but within reach of the spray at spring tides, *Littorina neritoides* was very abundant. It spent most of the time clustered in the crevices, and only came forth to browse on the unicellular algæ when the rocks were moistened at very high tides. This winkle has far more claim to a place in our list of terrestrial mollusca than several that find a place therein.

Littorina rudis co-exists with *L. neritoides* above high water mark, but also extends down to well between the tide marks. This animal varies greatly in size and shell-colour according to its station. At about half-tide mark nearly all the specimens were white or yellow and of a large size (up to 16 mm. in height); the pale-purple form also occurred, very rarely, in this zone. At high tide line at Thornwick Bay these winkles were of small size (rarely exceeding 12 mm. and usually less), and of extremely various colours—white, yellow, red, orange, purple, brown and brown with white stripes, or yellow stripes. At the same level but in another locality, further east, more exposed to the wash of the waves, the species was of intermediate size (about 13 mm.) and not so varied in colour, only the white, yellow, and purple forms being present in approximately equal numbers, and a few striped individuals.

Littorina littorea, and its red and yellow shelled varieties, was abundant above low water mark, and *L. obtusata* (chiefly the green shelled form) I found abundantly on the *Fucus*.

On all the rocks above low tide *Patella* and *Purpura lapillus* are exceedingly numerous, and I repeatedly saw the latter feeding on small individuals of *Mytilus edulis*, into the shells of which it had drilled a hole.

At low tide *Acmæa virginea* was found rarely at Thornwick Nab, and very small specimens of *Anomia ephippium*.

Between the tide marks occurred, in Thornwick Bay, *Chiton marginatus* and *Trochus cinerarius*, covered with alga and the latter much eroded.

On the *Laminaria* I noted *Helcion pellucidum*, young *Mytilus edulis*, *Lacuna divaricata*, and *Rissoa interrupta*.

Boring in the flat rocks near low tide mark *Pholas crispata* occurs, and in pieces of chalk and limestone amongst the shingle were many dead shells of *Saxicava rugosa*.

On wet rocks, moistened by springs, just above high water at the Dane's Dyke beach were *Limnæa truncatula* and *Succinea elegans*, the latter having narrower and more opaque shells than those found at Thornwick—a variation apparently related to the close proximity of (and even occasional spraying by) the sea, as I have previously observed at Sennen in Cornwall.

The Athoracophorid Slugs.—In Zoologischer Anzeiger, Jan., 1924, Grimpe and Hoffmann have an important paper on the slugs of the genus *Aneitea*, describing six new species from New Caledonia, and three new forms from the New Hebrides. They propose a new subgenus *Aneityopsis* on p. 171, but it is evident from the later pages that this is a misprint for *Aneityopsis*. However, this name is introduced for typical *Aneitea*, including *A. macdonaldi* Gray, and thus is needless. I will designate *A. macdonaldi* (which is cited by the authors) as the type of *Aneityopsis*. The proposition that *Aneitea* s. str. is subgenerically separable from *Triboniophorus* Humbert appears to be valid.—T. D. A. COCKERELL.

***Helix pisana* var. *sagittifera* Taylor.**—This form of *H. pisana*, said to be not uncommon about Tenby, was named by Taylor in his Monograph, 1912. It is of interest to note that as long ago as 1803 Col. Montagu figured it, also from Tenby, as *Helix cingenda*. It is not advisable to take up Montagu's designation in place of Taylor's, because the accompanying description is general for the species, and has no special reference to the particular form figured.—T. D. A. COCKERELL.

EDITORIAL NOTES.

HEARTY congratulations to Mr. R. Standen on the M.Sc. degree which the Court of the Manchester University has recently conferred upon him, in recognition of his life-work upon conchology, ornithology, ethnology and other branches of science. Besides smaller papers in the domain of conchology one may recall his "Land and Freshwater Mollusca of Lancashire" (1887), and his co-operation with Dr. Melvill on the "Marine Mollusca of the Scottish National Antarctic Expedition," "The Shells of the Loyalty Islands," and the many reports on the mollusca of the Persian Gulf and Arabian Sea.

Congratulations likewise to Mr. A. S. Kennard who has recently been elected an Associate of the Linnean Society.

We greatly regret the recent deaths of Dr. Annandale of the Indian Museum at Calcutta, and of Dr. Péringuey of the South African Museum at Cape Town. The former had in the last few years developed a great interest in the mollusca and published an invaluable series of studies, mainly on freshwater groups, in the "Records of the Indian Museum."

This year sees the completion of the fiftieth year of our *Journal*, vol. i, no. 1 having been published in February, 1874. This number consisted of sixteen pages, contributed by Messrs. Hebden, R. M. Lloyd, Sheriff-Tye and Dr. Jeffreys, with an introduction, presumably by Mr. J. W. Taylor, who (we rejoice to think) is still among us. All honour to Mr. Taylor for his splendid enterprise in starting this magazine. He can hardly doubt now that his venture has fully justified itself, and has been from the very first the stimulus and rallying-point that he hoped it might prove to be.

In the obituary notice of Mr. J. T. Marshall, in our last number, we added a list of all the new species and varieties described by him. Some of these, of course, are synonyms and Mr. McClelland writes to point out that *Venus fasciata* var. *pallida* was described under the same name by Simpson nearly four years earlier in *Journ. Conch.*, xiii, p. III.

The following quotation from a letter received from Mr. Anthony J. Arkell is very interesting. The mollusc referred to is *Ampullaria wernei* Phil. :—

13.6.23.

ON TREK, KUTTUM,
DARFUR.

This is the first live mollusc that I have found in Darfur; they were right on our N.W. boundary in a place I should never have imagined would contain shells, as I had traversed some 35 miles of country, without even a well in it, to get there.

They come from a place called Bueira in the Wadi Howar. I haven't a map with me but it is about lat. 15° 30', long. 24°. The Wadi Howar is here a depression about three miles broad, full of trees, running from east to west. In the rains its water is said to run up north-west across the Libyan desert towards the Nile at Dongola. The shells were aestivating in the dry bed of what must, for some time after the rains, be a large lake in the bed of this wadi. I owe their discovery to jackals, who had been digging them up out of the hard mud and eating them. The place was littered with broken shells, many of them being the remains of shells apparently larger than any I found alive.

An interesting point is that only those that have the luck to aestivate where the shade of a bush protects them for at least part of the day seem to survive the sun's heat. All those I dug up in the open had died not so very long before; and it does not look as if more than 10 to 20% of the rest survive the jackals. The species may have been reported from Kordofan: my servant told me that he had seen lots there in the ¹rahads. My district is the northern and so most waterless part of Darfur, and that is probably why I have not found any other molluscs except a few dead shells of a large snail perhaps akin to *Bulimus*.

[Mr. Arkell subsequently sent me specimens of *Zootecus insularis* Ehrenberg and of *Pupoides chanleri* Preston from the Kaja Katul Hills in Northern Kordofan].

It may be recollected that Mr. Berthold Sundler described an albino form of *Acanthinula lamellata* as var. *albida* nov. in this *Journal*, vol. xvi, p. 285. Mr. Hans Schlesch had, however, previously named this form var. *albina* in "The Naturalist" for Feby., 1921, p. 82, and the latter name will, of course, stand on the ground of priority. That this publication by Mr. Schlesch was not playing the game will be obvious from the following signed statement. Mr. Sundler, with his usual generosity, had distributed series of his novelty to many collectors before publishing an account of it, and advantage was taken of this unwarrantably to forestall him.

"On account of a notice in "The Naturalist" of February, 1921, p. 82, *Helix lamellata* Jeffreys var. *albina* nov., I beg to state that in the autumn of 1920 I had written to Mr. Schlesch that I was going to publish my discovery of this shell in a Swedish journal. When in the same year I became a member of the Conchological Society, I, however, resolved upon publishing my discovery there, as we have no society of this kind in Sweden."

BERTHOLD SUNDLER.

Mr. W. Gyngell sends the following cutting from "The Field" of Aug. 23, 1923. It is headed "The Curlew in Kintyre":—"When frost comes the curlew are forced to leave their favourite feeding grounds; they then frequent an extensive warren by the seashore, where they live on the common striped snails found in numbers hibernating in or about rabbit-holes. The birds swallow the snails entire but eject the shell, crushed into powder in the gizzard, in the form of a pellet or casting. A queer fact is that curlew fail to discriminate between full and empty snail shells. They frequently swallow the latter but these are ejected unbroken" (Dugald Macintyre).

In the "Journal of the Washington Academy of Sciences," xiv, 177, April, 1924, Dr. Dall has a short paper "On the value of nuclear characters in the classification of Marine Gastropods," from which we quote the following:—"The primal protoconch, at first of a horny consistency, in most cases is promptly calcified and remains permanently as the apical point of the nuclear portion of the shell. In many of the species from deep water it is more or less inflated or even mammillary. . . . In a much smaller group of gastropods the nucleus remains permanently horny; either without sculpture (*Dolium*); with spiral lines furnished with prominent dermal hairs (*Fusitriton*); or with sculpture of varied complexity. In the last case the sculpture is most commonly an oblique reticulation, more or less fine, with a less evident fine spiral striation. In common with most students I have regarded the nuclear characters as more or less indicative of generic affinity, but recently having had to work over large numbers of deep-water species,

especially toxoglossate forms, and to utilize Hedley's fine monograph of the Australian *Turridæ*, I have found this view to involve so many apparently preposterous combinations of unlike things and separation of similar things, that I have come to the conclusion that this view cannot be maintained. The simple smooth inflated protoconch is found, among others, to occur in the deep-water species of the following very diverse groups:—*Turridæ*, *Cancellariidæ*, *Olivellidæ*, *Marginellidæ*, *Fasciolaridæ*, *Chrysodomidæ*, *Columbellidæ*, *Muricidæ*, *Melanellidæ*, *Triviidæ*, *Triphoridæ*, *Cerithiopsidæ*, *Trichotropidæ*, *Rissoidæ*.

The following, among others, include species with horny nuclei:—*Turridæ*, *Caricellinæ*, *Muricidæ*, *Tonnidæ*, *Cassididæ*, *Cymatiidæ*, *Triphoridæ*, *Cerithiopsidæ*, *Trichotropidæ*.

The most common form of the horny nucleus with oblique reticulation was originally caught in the tow-net and described as a genus *Sinusigera* and I have therefore called it the *Sinusigera* nucleus. The form dehiscent in the ovicapsule can be denominated the *Caricella* nucleus. The smooth or nearly smooth form which occurs in the Tun and Helmet shells might be named the *Tonna* nucleus. Lastly the elevated, spirally ciliated form found in *Austrotriton* and probably other *Cymatiidæ* can be named the *Triton* nucleus."

Mr. Bryant Walker has recently published a monograph of "The Ancyliidæ of South Africa," 82 pp. of text with two plates and a large number of text-figures of radulæ, etc. Its value is added to by an excursus of some 20 pp. on the classification of the *Ancyliidæ* of the world, and another of 6 pp. on hyperstrophy. It may be well to call attention to the fact that *lacustris* L. has now been shown to be the type of *Ancylus*, and that accordingly Mr. Walker founded a new genus *Pseud-ancylus* for *fluviatilis* Müller in the "Nautilus," xxxv, 58.

In the Annals & Mag. Nat. Hist. (9) xii, 435, Miss Massey and Mr. G. C. Robson described a novel case of sex-dimorphism in *Doratosepio confusa* Smith, a South African cuttle-fish, and in the Proceedings of the Royal Society, B. vol. xcvi, p. 260, Messrs. Carleton and Robson discuss the histology and functions of the novel organs. The male of this species possesses a long streamer-like prolongation of the lateral fins (called for convenience the "tail") which is entirely absent in the female, and moreover has two strips of tissue, one on each side towards the extremity of the "tail," which consist largely of a substance unlike any of the special tissues characteristic of the Cephalopoda. The authors suggest that these strips, called the "lateral organs," secrete a substance that attracts the female, and that the "tail" forms part of the mechanism of insemination. The paper is illustrated with figures from micro-photographs.

NOTE ON THE DISCOVERY OF A COLONY OF *VITREA LUCIDA* (Drap.) AT ARNSIDE, WESTMORLAND.

By W. E. ALKINS, M.Sc.

(Read before the Society, May 3rd, 1924).

THE existence of a colony of *Vitrea lucida* (Drap.) at Grange-over-Sands, on the northern shore of the estuary of the river Kent, has been known since 1903 (*Journal of Conchology*, xi, 45-46), and the taking of further specimens has been recorded at intervals (*ibid.*, xi, 361; xii, 156, 221, 329). A detailed description of the habitat—on and near the limestone cliffs on the northern or landward side of Lindale Road, near to the railway station at Grange-over-Sands—was given by J. W. Jackson (*loc. cit.*, xiii, 65-68), who was able to add another habitat, “on the Furness railway embankment, quite a third of a mile from the Lindale Road Cliffs.” He also recorded the discovery by F. Booth of a dead shell of the species on the railway embankment near Holme Island, which might indicate another, probably introduced, colony.

The writer took a number of examples of the species in the Lindale Road station in April and again in August, 1921. The shells were reasonably numerous, twelve to fifteen living specimens being found, but none was taken actually from the ledges of the cliffs, as in Mr. Jackson’s experience; all were obtained among the grass and vegetation at the foot of the cliffs, perhaps half-a-dozen between the grass-roots and the rock and the remainder under a heap of decaying plant refuse, which retained moisture longer than the open roadside bank and, perhaps for this reason, formed an efficient trap.

In August, 1922, a new habitat for the species was discovered at Arnside, Westmorland, on the southern shore of the Kent estuary. The shells occurred on the east side of Orchard Road, at the south (higher) end of the road, for some thirty or forty yards from its junction with Redhills Road. They were found in the grass and at the foot of the roadside wall; the most effective trap noticed here was a piece of thick wet cardboard, on which *lucida* appeared to feed. There were very few associated species, *P. rotundata* (Müller) and *Ar. ater* (L.) alone being seen. Search in the neighbourhood did not result in the discovery of the species elsewhere, and the restricted nature of the locus, coupled with the proximity of houses and gardens, rather suggests that it may be a comparatively recent introduction. There is no apparent reason which may be offered to indicate that the species has been introduced from its Grange station, and the Kent estuary must obviously form and have formed for some thousands of

years a formidable obstacle to the free diffusion of terrestrial mollusca. The Arnside shells are rather larger than those taken by the present writer at Grange, though the largest, with major diameter $13\frac{1}{2}$ mm., is less than the largest Mr. Jackson records from Grange (15 mm.).

In the circumstances the writer thinks it desirable to put on record this discovery, for although it does not constitute a new vice-comital record, it does form an interesting extension of the known range of the species, which is far from common in the north of England.

Lepton squamosum (Montagu).—I had one of these molluscs under observation for over a week in captivity. It was obtained from a *Gebia* burrow at Salcombe. I am able to verify that it is incubatory like so many of the Submytilacea, for the young were retained in the gills until a cloud of young Lepton came out into the surrounding water with perfectly formed embryonic shells. The published figures and descriptions do not give a correct impression of the mantle, which is not only



extended well beyond the shell on both sides and ventrally, but also covers the shell itself almost completely. This part of the mantle is also covered with some scores of small tentacles, less than half the size of those round the shell margin. When worried, the animal can withdraw wholly within the shell.—R. WINCKWORTH.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

527th Meeting, held at the Manchester Museum, March 5th, 1924.

The President, Mr. J. Wilfrid Jackson, M.Sc., F.G.S., in the chair.

Candidate Proposed for Membership.

Miss Kathleen Marion Collier, 25, Church Road, Tunbridge Wells (introduced by J. W. Jackson and R. Standen).

Resignations.

A. Harman.

Dr. K. H. Jones.

Principal Exhibits.

By Mr. A. G. Stubbs:—A beautiful series of coloured drawings of British Non-Marine Mollusca.

By Rev. L. W. Grensted:—*Oliva pallida*, Swainson, from Accra, West Africa.

By Mr. G. C. Spence:—*Placostylus bivaricosus*, Gask., mountain form, from Lord Howe Id.; *Limicolaria distincta*, Putz., from Leverville, Congo.

The Special Exhibit was *Paludestrina jenkinsi*, on which the President gave an interesting and detailed talk.

528th Meeting, held at the Manchester Museum, April 5th, 1924.

Mr. G. C. Spence in the chair.

New Member Elected.

Miss Kathleen Marion Collier.

Candidate Proposed for Membership.

Leonard Carse Hann, A.C.P., Kite Hill School, Oakwood Avenue, Purley, Surrey (introduced by J. C. Dacie and J. E. Cooper).

Papers Read.

“Obituary Notice; Lieut.-Col. H. H. Godwin-Austen, F.R.S.,” by J. Cosmo Melvill, D.Sc.

“Notes on some Mactridæ,” and “Mollusca of the Wilkins Australian Islands Expedition (1923),” by J. R. le B. Tomlin, M.A.

Exhibits.

By Mr. G. C. Spence: *Anodonta waterstoni* Tomlin (paratypes), from Lake Beschik, Salonika.

By Mrs. Gill: A series of the rarer Textile Cones.

By Mr. R. Standen: A curiously “repaired” example of *Helix vermiculata* Müll.; a number of shells from Andaman Islands, including *Cypræa erronea* var. *chrysophæa* Melv.; two dwarf *Pterocera lambis*—one with liver-coloured and the other with blood-red base; *Cypræa arabica* L. with unusual markings, probably due to some disease of the mantle lobes; also a fine specimen of *Murex eurypteron* Rve. from Japan—all from the collection of C. J. Mogridge.

The special exhibit was “The British Land Operculates.” Many locality sets were shewn by various members, and some kindred species from the continent were exhibited, for comparison, by Mr. G. C. Spence.

529th Meeting, held at the Manchester Museum, May 3rd, 1924.

The President, Mr. J. Wilfrid Jackson, M.Sc., F.G.S., in the chair.

New Member Elected.

Leonard C. Hann.

Papers Read.

"Some New Variations of Slugs," by F. Ökland.

"Land Mollusca on the Mewstone," by A. E. Ellis.

"Note on the Discovery of a Colony of *Vitrea lucida* (Drap.) at Arnside, Westmorland," by W. E. Alkins, M.Sc.

"The Significance of the Intestinal Convolutions and Shell Structure in the genus *Milax*, with remarks upon the Hyperstrophic Inversion," by Jno. W. Taylor, M.Sc.

"*Vertigo pusilla* in South Lancashire," by the Rev. L. W. Grensted, M.A., B.D.

Exhibits.

By Mr. E. R. Brown: Series of *Oliva*, including *O. stainforthii* Rve., *marmorata* Mart., *duclosi* Rve. and var. *oshimæ*, *smithii* Bridgeman, *carneola* Gmel., and fine varieties, *ispidula* var. *tigridella* Duclos.

By Rev. L. W. Grensted: *Vertigo pusilla*, from Hall-road sandhills, Lancs., to illustrate his note.

By Mr. R. Standen: *Trophon triangulatus* Carp., from California; *Melongena corona* Gmel., Florida, and var. *bispinosa* Phil., Yucatan; *Melania asanthica* Brod., Vate, New Hebrides (thickly covered with manganese mud); *Melanopsis dufouri* Fér., Morocco (with curious extraneous growth at apex) ex Manchester Museum Collections.

Vertigo pusilla in South Lancashire.—On April 3rd, 1924, I went back to the locality on Hall Road sandhills, from which last year I recorded *Vallonia costata* and *pulchella* (seg.), to get a series of the former species. Among them I took a single living specimen of *Vertigo pusilla*, this being the first record for these sandhills, and indeed for S. Lancs. whether in holocene pocket material or living. Further north a single holocene specimen of *V. angustior* has been taken in the pockets near Birkdale by Mr. A. Leicester, and I have taken the commoner species, *V. antivertigo* and *V. pygmæa*, sparingly at Hightown in the pockets, but never living. It is possible that *V. pusilla* is a recent introduction with *Vallonia costata*, as the locality is one where garden refuse has been tipped. But that is now some three years ago, so that the species is clearly quite at home. And it may be an actual survival, as there is a good deal of moisture in the sandy hollows, where such plants as *Parnassia palustris* occur.—L. W. GRENSTED
(Read before the Society, May, 3rd, 1924).

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T H E
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OBITUARY NOTICE: A. D. R. BACCHUS, F.E.S.

By J. D. DEAN, F.E.S.

AFTER a long period of suffering from injuries received as far back as 1917, while on active service, Arthur Douglas Bacchus, one of the most promising of the younger naturalists, has passed away. He was only 37 and leaves a wife and young family. In the war he was in the Machine Gun Guards, and was severely wounded by shrapnel and taken prisoner. He was among the exchanged prisoners, and when I saw him on his return he handed me a tube containing *Clausilia laminata* and *C. rolpheii*, which he had taken near the firing line in France, and had preserved for me all that time. I mention this as evidence of his great enthusiasm.

Conchology was his first attraction and Bacchus is the only one who has taken *Vertigo substriata* in Glamorgan. I call to memory several interesting meetings and rambles before the terrible war claimed him and so marked him that he never recovered. He recorded as new for Glamorgan *Milax gagates* and *Limnæa stagnalis* in 1916. After the war he removed to Bristol and there are several papers in this *Journal*, in vol. xvi, with new records for Wiltshire, Gloucester W., and Somerset. At this period entomology began to claim the greater share of his attention, more especially the Rhynchota and the Formicidæ.

He was a keen member of the Biological and Geological section of the Cardiff Naturalists' Society and afterwards of the Bristol Naturalist Society and Bristol Field Club. He was also a member of the newly-formed South-Western Naturalists' Union, and acted as recorder for the Heteroptera.

Perhaps Bacchus' most important paper to the *Journal* is the one drawing attention to a peculiar variety of *Hygromia fusca* at Leigh Woods, Bristol, read in 1921. This was the last paper the *Journal* received from him. He told me in a letter in 1923 that he was devoting all his time to the entomological census work, but that his wounds had crocked him up again. But never once either in speech or letter did he complain. In this he was a hero—yes, I feel this Society has lost a great worker and a hero—and each of us, a friend.

NOTES ON SOME BRITISH HELICIDÆ.

By A. E. ELLIS.

(Read before the Society, February 6th, 1924).

HELICELLA.

H. Virgata.—This species is frequent in the neighbourhood of Oxford; the normal banded form occurs at Kennington, Stonesfield, Peartree Hill, Lyehill Quarries at Wheatley and Watlington. At the last named place, by the roadsides, I found (in Oct., 1923) the following varieties: *hypozona*, *subcarinata*, *subalbida*, *depressa*, *lutescens* and *albicans*. At Peartree Hill (Oct., 1923) were found: vars. *hypozona*, *subcarinata*, *depressa*, *rufulozona*, and *lutescens*. At Stonesfield (Oct., 1923) in an Oolite (Stonesfield Slate) quarry, were noted: vars. *hypozona*, *depressa* and *lutescens*. At Wheatley, occur (Oct., 1923): vars. *grisea*, *depressa* and *lutescens*. Var. *lutescens* occurs at Kennington, and is the only form of the species found on Boar's Hill on the road-side. At Stonesfield the following species are found in the same quarry as the *virgata*: *Agriolimax agrestis*, *Vitrina pellucida*, *Polita cellaria*, *P. nitidula*, *Arion intermedius*, *Pyramidula rupestris*, *P. rotundata*, *Arion ater*, *Helicella itala*, *H. caperata* (and vars. *fulva*, *ornata*), *H. heripensis* (and var. *albicans*, which is usually of small size, and var. *lutescens*), *Theba cantiana* (and var. *albocincta*), *Hygromia hispida*, *H. striolata*, *Helix aspersa*, *H. pomatia*, *Ena obscura*, *Clausilia laminata* (and var. *albina*), *C. bidentata*, *Cepæa hortensis* and *Helicigona lapicida*. In the quarry at Wheatley the associated species are: *Polita nitidula*, *P. cellaria*, *Theba cantiana* (and vars. *alba*, *albocincta*), *Clausilia bidentata*, *Vitreola crystallina*, *Arion intermedius*, *Azeca menkeana*, *Cepæa nemoralis* v. *rubella*, *Vitrina pellucida*, *Helicella heripensis* (and vars. *albicans*, *lutescens*, and monstr. *subscalare*), *H. itala* (and vars. *lutescens*, *bizonalis*, *minor*, *coalita*, *charpentieri*, and monstr. *subscalare*), *Agriolimax agrestis*, *Hygromia striolata* (and var. *rubens*), *H. hispida*, *Arion hortensis*, *Pyramidula rotundata*, *Ena obscura*, *Vallonia excentrica*, *Pupilla muscorum*, *Pomatias elegans* and *Cæcilioides acicula*. In all the localities *H. heripensis* is associated with *H. virgata*, and at Watlington forms intermediate in appearance are found; whether this indicates hybridisation is not known, but I hope to institute breeding experiments with these two species, and *H. caperata*, with a view to elucidating this and other problems. At Bath (1920) I found vars. *lutescens*, *depressa* and *subcarinata* together with the type form. In August (1923) vars. *minor*, *lutescens* and the typical form were noted at Bempton, S.E. Yorks., vars. *depressa* and *minor* at Flamborough; var. *maculata* occurs at Flamborough Head. On the sand-hills near Sennen Cove, Cornwall (1919), I found vars. *leucozona*,

nigrescens, *rufulozona* and *maritima* in association with *H. itala* (and vars. *fasciata*, *coalita*). Var. *rufulozona* occurs at Dingley, Northants. (Sept., 1923), with var. *depressa*, var. *lutescens* and the normal form. I have received the following forms from Mr. O. W. Richards: var. *lutescens-minor*, Barry, Glam., (1919); var. *leucozona*, Towyn, Merioneth (Aug. 1920); var. *conica* Towyn; var. *rufulozona*, Towyn; var. *nigrescens*, Wantage, Berks. (1921); var. *lutescens*, Rickmansworth, Herts. (1920); Boulogne, France (Sept. 1921), Towyn, Cardiff, Glam. (1919); var. *albicans*, Rickmansworth, Cardiff; *hypo-zona*, Cardiff; *subalbida*, Wantage, Rickmansworth; var. *grisea*, Cardiff; var. *depressa*, Rickmansworth, Towyn; Cardiff; var. *alba* Towyn; typical form, Marazion, Cornwall (Aug. 1919), Towyn, Boulogne, Rickmansworth.

H. itala.—At Middleton, Northants., var *subpellucida* is the prevalent form, and *trivialis* occurs in lesser quantities (Oct., 1923). I have found var. *hyalozonata* on the railway embankment at Market Harborough, Leics. (Oct. 1923). Var. *coalita* occurs at Flamborough (Aug., 1923) and Desborough, Northants. (Sept., 1923). Var. *planorbis* I have found at Kibworth, Leics. (Oct., 1923). The following were collected by Mr. O. W. Richards: var. *lutescens*, Hinksey, Berks. (Oct., 1921); Little Hampden, Bucks. (1920); Wantage, Berks. (1921); Boulogne (1921); var. *concolor*, Reigate Hill, Surrey (Oct., 1921); *trivialis*, Ewelme, Oxon. (1921); Moutiers, Savoy (Sept., 1921); Wantage; Reigate Hill; Boulogne; Porthkerry, Glam. (1920); var. *obliterata*, Wantage; var. *monozona*, Wantage; var. *major* Dum. et Mort., Ewelme; var. *charpentieri*, Boulogne; var. *planorbis*, Porthkerry. I have seen this animal crawling about on a mild day following frost (Jan. 12th, 1924).

H. caperata.—In a quarry near Elsfield, Oxon., this species is found (May, 1922) in company with *Agriolimax agrestis*, *Vitrina bellucida*, *Vitrea crystallina*, *Polita cellaria*, *P. rogersi*, *P. nitidula*, *Arion ater* var. *rufa*, *A. hortensis*, *A. circumscriptus*, *Helicella itala*, *H. caperata*, *H. heripensis*, *Helix aspersa*, *Cepæa hortensis*, *C. nemoralis*, *Cochlicopa lubrica*, *Clausilia bidentata*, *Hygromia striolata*, *H. hispida*, *Pyramidula rotundata*, *Ena obscura*, *Clausilia laminata*, *Theba cantiana*, *Carychium minimum*, and *Pomatias elegans*; *caperata* and *heripensis* overlap one another's territory only at the edge of the quarry, where it borders on an arable field, *heripensis* being found to the exclusion of its congener in the field, and occurring very sparsely in the quarry. *Caperata* is not common in the neighbourhood of Oxford, although *heripensis* is very abundant; it occurs on Boar's Hill, near Watlington, at Islip (var. *ornata*), and at Ewelme (var. *ornata*, O. W. Richards, 1921). I have found this snail on the sand-hills near Sennen, Cornwall (1919). I have received specimens from Mr.

O. W. Richards from the following localities: Longworth, Hereford 1920, (also var. *fulva*); Boulogne (Sept., 1921); Savoie, France, Sept., 1921 (var. *ornata*, very small); Belsize, Herts. 1920; (and var. *ornata*); Towyn (Aug., 1920; var. *fulva*); Leckwith, Glam. (1920; and vars. *ornata*, *fulva*); Mewstone, Plymouth (April, 1923).

H. heripensis.—Mr. O. W. Richards has given me specimens of this species from Loudwater, Bucks. (1921); Wantage, Berks. (June, 1921); Belsize, Herts., 1920 (and var. *albicans*); and Boulogne (Sept., 1921). This snail is frequent on roadsides, in quarries and by the sides of fields near Oxford. Besides the localities above cited, I have found it at Woodstock (Oct., 1923), where it particularly congregates on dead stems of the Wild Parsnip (*Peucedanum sativum*), and at Elsfield, amongst long grass at the side of the road (Oct., 1923). At Wheatley it is found on *Reseda luteola*, on dead leaves of the Sycamore and other trees, on the bare ground and especially on the withered flower-heads and leaves of *Cnicus acaulis*. I have never seen this snail on living plants, except at rest; it is generally found when active on dead grass and herbage, or on the ground, on which the common unicolorous form is difficult to detect. I have found carinate and subscalariform varieties in the neighbourhood of Oxford, and a form with a flat spire, for which I propose the usual names *carinata*, *subscalariformis*, and *planospira* respectively; the specimens have been sent to the British Museum. Vars. *albicans* and *lutescens* are common near Oxford. Some specimens are as narrowly umbilicate as *H. caperata*, but the majority have an open umbilicus showing the interior of the spire.

COCHLICELLA BARBARA.

The type is abundant on the sand-hills at Whitsand Bay, Cornwall, where vars. *bizona* and *articulata* are also found (1918). The largest specimen I have from this locality measures 12.5 mm. in height, but most of the shells are considerably smaller. Var. *bizona* occurs at Marazion (O. W. Richards, 1919); var. *strigata*, Porthcawl, Glam. (O. W. Richards, 1919).

THEBA CANTIANA.

Typical form, Stonesfield (May, 1922); Kennington, (Oct., 1923); Andoversford, Glos. (Sept., 1920; O. W. Richards); Walton-on-the-Hill, Surrey (1920; O. W. Richards); Headington, Oxford (Oct., 1923). Var. *alba*, Little Hampden, Bucks. (July 1921; O. W. Richards); Stonesfield (May, 1922); Andoversford (1920; O. W. Richards); Watlington (Oct., 1923) (and one somewhat depressed form); Peartree Hill (Oct., 1923). Var. *albocincta*, Penmark, Glam. (1919; O. W. Richards); Radley Woods (May, 1922); Watlington (Oct., 1923); Peartree Hill, Oxon. (Oct., 1923); Headington (Oct., 1923); Stonesfield (May 1922); Kennington, Berks. (Oct., 1923, with var. *depressa*).

HYGROMIA.

H. hispida.—Var. *albocincta*, Hendon, Middlesex (Dec., 1921, O. W. Richards); Hinksey Berks., with the typical form and var. *albida* (Oct., 1921, O. W. Richards); Wytham Park, Berks. (May, 1922) with the typical form and var. *fusca*. Var. *fusca*, with the type, Val d' Isère, France (Sept., 1921, O. W. Richards); Little Hampden, Bucks., with var. *albida* (July, 1921, O. W. Richards); Stonesfield, (May, 1922), with the normal form and var. *albocincta*.

H. striolata.—Var. *alba*, Penolva, Cornwall (1919, O. W. Richards); Hinksey, Berks., with var. *rubens* (Oct., 1921, O. W. Richards). Var. *albocincta*, Radley Woods (May, 1922); Andoversford, Glos. (Sept., 1920), with the typical form. Var. *rubens*, Leckhampton, Glos. (July 1922), with var. *albocincta* and the typical form; Little Hampden, Bucks. (July 1921), with var. *albocincta*; near Elsfield, Oxon., with var. *albocincta* (May, 1922).

HELICIGONA LAPICIDA.

Var. *trifasciata*, 02340, Moutiers, Savoie (Sept. 1921, O. W. Richards); var. *infra fasciata*, together with the bandless form, Castell Coch, Glamorgan (April, 1918, O. W. Richards); var. *bifasciata*, Mordiford, Hereford (1920), band formula 00340 (O. W. Richards).

ARIANTA ARBUSTORUM.

On the banks of the canal at Limpley Stoke, near Bath (Feb., 1921), were found the typical form and vars. *fuscescens*, *flavescens* and *luteofasciata*. The typical form and var. *fuscescens* occur on the banks of the Thames at Oxford. The following were collected by Mr. O. W. Richards: Val d' Isère, Savoie (Sept., 1921), vars. *flavescens*, *alpicola*, *cincta*, *trochoidalis*, and the typical form; var. *flavescens*, Andoversford, Glos. (1920); var. *subscalaris*, Torpantau, Brecon (1918); Hunderton, Hereford (1920), with the type and var. *fuscescens*; var. *fuscescens*, Sarratt, Herts. (August, 1921), with the normal form; typical form, Ely, Glamorgan (1920).

EUPARYPHA PISANA.

Porthcawl, Glamorgan (1920), the typical form and vars. *albida*, *punctella*, *interrupta*, *musica*, *bifrons* and *spirolineata* (O. W. Richards).

HELIX.

At Stonesfield, Oxfordshire, on May 1st, 1923, amongst a large colony of *H. pomatia*, most of which were engaged in love-making, I found several specimens with the aperture partly closed by a septum, as described on page 477, vol. 3, of Taylor's Monograph. There were also the following varieties: *inflata* Hartmann, and *pyrgia* Bourg.

H. aspersa.—At Middleton, Northants. (Sept. 1923), amongst a group of nine snails aestivating in a hole in a wall, were the following five forms: the normal 1(23)45 form, var. *conoidea* Picard,

var. *minor*, var. *albofasciata* Jeffreys, and var. *semifusca* Cockerell. At Market Harborough, Leics., I have recorded var. *fasciata* 12345, var. *albofasciata* (Aug. 1923), *minor* (1921), and the type form, 1(23)45. Four snails clustered together in hibernation at Limpley Stoke, near Bath (April, 1921), comprised the varieties *flammea* Picard, *lutescens* Cockerell, *acuminata* Baudon and *grisea* Moq. Var. *rufescens* Picard 1(23)45 occurs at Stonesfield (May, 1923). I found var. *flammea* at S. Just-in-Penwith, Cornwall (1919). Amongst a number of shells of *H. aspersa* given me by Mr. O. W. Richards are the following varieties: *fasciata* 12345, Boulogne (Sept., 1921); *flammea*, Ely, Glam. (1920); Pop Hill, Glam. (1920); Mousehole, Cornwall (1919); Towyn, Merioneth (1920); Radyr, Glam. (1920); Hunderton, Hereford (1920); Zennor, Cornwall (1919); Flatholm, Glam. (1920); Lisvane, Glam. (1920); *albofasciata*, Towyn (1920); Penzance (1919); *puncticulata* Baudon, Madron, Cornwall (1919); Hunderton (1920); *minor*, Towyn (1920); *exalbida*, Towyn (1920); *fasciata*, 1(23)(45), Paul, Cornwall (1919); 1(234)5, Flatholm (1920).

H. nemoralis. — At S. Just-in-Penwith (1918), I found the following vars.: *libellula* 00300, 12345, 00000, (12)3(45), 123(45), *rubella* 00000, 00300, :2300, *libellula-fasci Alba* 00300, *libellula-rubella* 00000, *polia* Moq., and *rubella-fasci Alba* 00300. In blown sand at Sennen Cove, Cornwall (1918): *libellula-fasci Alba* 00300, *libellula-parva* 123(45), 00045. Cleeve Hill, near Cheltenham, Glos. (July, 1922), *libellula* 12345, 123(45), ::345, 00345, 1:345, *rubella* 10345, 00:(45), 02345. Radley Woods, Berks. (May, 1922): *libellula* 12345, *rubella* 00000, *castanea* 00000. Bagley Woods, Berks. (1922): *rubella* 00000, (12)0(45), *rubella-fasci Alba* 00300. Leckhampton, Glos. (July, 1922): *libellula* ::3:: Stow Wood, Oxford, (May, 1922): *rubella* 12345, *libellula* 12345. Studley, Oxon. (Feb. 1923): *libellula* (123)(45).

The following varieties were collected by Mr. O. W. Richards: Hereford (1920), *libellula* 12345, (123)(45), (12)3(45), 123(45), (123)45, 1(23)45, :2345, *rubella* ::00, :2345, 00000, 12345, (123)(45), 123(45), (123)45, *rubella-fasci Alba* 00300, *rubella-compressa* 12345, *castanea* 00000. Bullingham, Hereford (1920): *castanea-hyalozonata* ::34:. Moutiers, Savoie, France (Sept. 1921): *libellula-magna* 00000, 12345, 00045, 000:5, 1:345, 10345, 00345, *albina-roseolabiata*, ::34:, ::345. S. Foye, France (August, 1921), *albina-roseolabiata* ::045. Culoz, Ain, (Sept. 1921): *libellula-magna* 00300, *rubella-magna* 00000. Lamorna, Cornwall (1919): *libellula-fasci Alba* 00300, *libellula* 00300, *rubella* 00000. Treen, Cornwall (1919): *libellula* 12345, (123)(45). Mordiford, Hereford (1920): *libellula* ::345, 12345. Oddington, Oxon. (1921): *libellula* (123)45. Watlington, Oxon. (1921): *libellula-albilabris* 00000. Towyn, Merioneth (Aug. 1920):

libellula 12345, 10345, 00345, 0034:, 00340, 0:345, 00305, ::3(45), ::45, 1::45, 02345, 120(45), 0::45, 1:3(45), 12045, 1:345, 12:45, 0:300, 02340, 0034:, 003:5, *libellula-fascialba* 00300, *albinos* Charpentier, 00345, 12345, 10345, (12)345, (12)3(45), *rubella-parva* 00000, 00300, *rubella* 00000, 00300, 10345, 00345, 0030:, 0034:, 0:300, :0345, :0045, (12)0(45), 0:345, ::045, 12:45, *rubella-undulata* 00340, *rubella-fascialba* 00300, *libellula-parva* 00300. Hinksey, Berks. (1921): *libellula* 12345, 02345, *rubella* 12345, 02345, *castanea* 00000. Fairwater, Glam. (1920): *castanea* 00000. Penzance (1919): *libellula* 00000, 12345, 00345, 0:345, *rubella-fascialba* 00300. S. Mellons, Monmouth (1919): *rubella* 00300. Flatholm (1920): *libellula* 00000, :2345, 023(45), 00::, 003::, *rubella-fascialba* 00300. S. Fagans, Glam. (1920): *rubella-roseozonata* 12345. Lelant, Cornwall (1920): *libellula* 00045. Checkley, Hereford (1920): *libellula* 00(34)0. Great Missenden, Bucks. (1921) and Hunderton (1920): *rubella* 12345. Cardiff (1918): *rubella* 12345, *rubella-albilabris* 12345. Middleton, Northants. (Sept. 1923): *albinos* 12345, *libellula* (12)3(45).

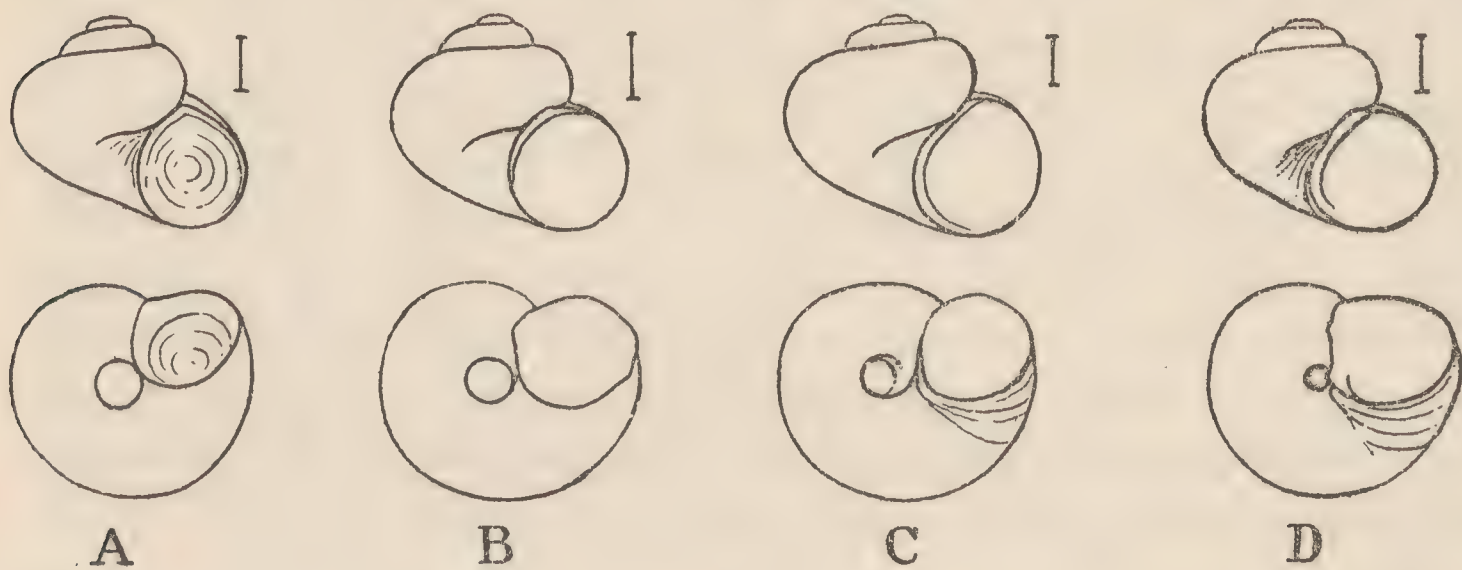
H. hortensis.—Stow Wood, Oxford (May, 1922): *lutea* 1(23)45, 12345, *lurida* 12345. Radley Woods, Berks. (May, 1922): *lutea* 00000. Leckhampton (July, 1922): *lutea* 12345, 00000, *albina* 00000, *arenicola* 12345, (12)3(45). Headington Wick Copse, Oxford (1923): *lutea* (123)45. Great Bowden, Leics. (May, 1923): *lutea* 12345. Bath (1920): *bouchardia*, *putonia*, *rufozonata* 12345, *lafondia*, *lutea* 10345, 1(23)45, (12)3(45), 00000, *aleronia*, *subglobosa*, *flavovirens* 00000, *arenicola* 12345, *subalbida*, *pallida-roseolabiata* 00000, ::00, *colorata*, *lurida* 12345, 10045, ::345, ::045, 00345, 10345. The following variations I have received from Mr. O. W. Richards: Penzance (1919): *lutea* (12345), (123)(45), 00000, *incarnata* 00000, *albina* 00000. Ely, Glam. (1919): *arenicola* (12)3(45), 123(45), 12345, (12345), 1:3(45), 10345, *lurida*, 12345, *lutea* 00000, (123)(45), 10345, 103(45), 1(23)(45), 12345, *lilacina-arenicola* 123(45). Hereford (1920): *lutea* (123)45, 1(234)5, 1(23)45, 12345, (12345), 1(2345), (123)(45), *lutea-parva* 12345, (123)(45), *lurida* 12345, (123)(45), *arenicola* 12345, 1(23)45, (123)(45), (12345), 1(23)(45), *albina* 00000. Hunderton (1920): *lutea* (12)345, (12)3(45). Llandaff, Glam. (1919): *albina-roseolabiata* (123)45. Hendon, Middlesex (1920): *albina* 00000, *lutea* 12345. Chalfont, S. Giles, Bucks. (Sept., 1921): *pallida-roseozonata-roseolabiata* 023(45). At Great Easton, Leics., (Sept., 1923), I found *lutea* 00000 and 12345. At Rothwell, Northants. (Jan. 14th, 1924), I noticed this snail, and *Hygromia striolata*, *H. hispida*, *Arion hortensis*, *Agriolimax agrestis*, and *Helicella caperata* (the last in numbers on dead leaves of *Tussilago farfara*) actively moving about a few days after a hard frost.

THE OCCURRENCE OF VALVATA PISCINALIS f.
ALPESTRIS Blauner IN SCOTLAND.

BY THE LATE DR. N. ANNANDALE.

(Read before the Society, September 6th, 1924).

IN the summer of 1921 I dredged from the exit of Loch Lubnaig, in Perthshire, three living specimens of a *Valvata* which agree closely with continental examples of *V. alpestris* Blauner. The form *alpestris* is evidently no more than a phase of *V. piscinalis*, distinguished mainly by its much larger and more open umbilicus, but I cannot find any record of its occurrence in the British Isles. It is linked on to the typical *piscinalis* by a form which bears the name *V. alpestris* var. *greimblichi* Gredler in the collection of the Indian Museum. The label is in Gredler's handwriting, but I have been unable to trace any description of this form. To render the matter clear I figure in outline (A) a shell of the form *alpestris* from Loch Lubnaig, (B) a specimen of the same form from the Tyrol, (C) one of the "var. *greimblichi*" from Hull and (D) a typical English shell of *V. piscinalis*.



Nesopupa armata (Pease).—Last July Mrs. Cockerell visited the Island of Rarotonga, and collected there a *Nesopupa* which can by no means be separated from *N. armata*, described from Borabora, Society Islands. The aperture is fully armed with the characteristic lamellæ, as figured by Pilsbry, only the infraparietal lamella is larger, quite half as long as the parietal. The shell is about 2.3 mm. long, with the characteristic sculpture, the upper whorls with remote cuticular riblets. This is the first record of a *Nesopupa* from Rarotonga, since it appears that *N. dentifera* (Pease), supposed to be from there, came from Aitutaki. Our shell does not agree with Pilsbry's figure of *N. dentifera*, but it may be that the latter is a varietal form of *armata*. Since the fauna of the Polynesian Islands is in general so extremely different from that of the Hawaiian group, and the sculpture of typical *Nesopupa* is so distinctive, it would seem that *Nesopupilla* and other groups should be regarded as generically distinct.—T. D. A. COCKERELL.

AN ISLET FAUNA.

BY REV. L. W. GRENSTED.

(Read before the Society, September 6th, 1924).

WHILE on a short holiday, near Ullswater, I had an opportunity of examining the island House Holme, in the middle of the lake, for mollusca. The following is the resulting list :—

Limax arborum (one).

Arion subfuscus (abundant, all sub-var. *brunnea*).

Vitrea pura (one).

Pyramidula rotundata (a few).

Cochlicopa lubrica (one).

Pupa cylindracea (common).

The curious feature of this list is the absence of the three slugs which are commonest on the mainland close by, *Arion ater*, *A. circumscriptus* and *Agriolimax agrestis*, and the extreme abundance of *Arion subfuscus*. It was hardly possible to pull aside a handful of grass without finding two or three specimens at its roots. This may, of course, be due to a simple accident of colonization, but it is interesting that *A. subfuscus*, *L. arborum*, and *P. rotundata* are all of types which represent early stage in molluscan development, and it may not be due simply to chance that this isolated rock has preserved what seems to be an archaic fauna, undisturbed by the invasion of later and stronger types..

On the mainland (Cumberland side) it may be worth while to record the following colour varieties :—*Limax maximus* var. *concolor* (two), *Arion ater* type abundant, var. *brunnea* (one), var. *plumbea* (one), *Arion subfuscus* sub-var. *aurantiaca* (two—this form did not occur on the island). Also a colony of *Balea perversa* in Glencoin.

Length of life of *Paludestrina ulvæ*.—A young specimen was isolated on June 2nd, 1919, in a small wide-mouthed glass bottle with about two ounces of sea water and a little conferva and shell sand. The bottle was corked and kept in subdued light. On August 23rd, 1924, it was still living. A specimen similarly isolated on August 17th, 1919, was also living on August 23rd, 1924. The vessels contain no other organisms visible to the naked eye. Hence it is evident that under artificial conditions *P. ulvæ* can live for over five years. If they live as long or longer under natural conditions, this must be one factor accounting for their enormous numbers in our estuaries.—H. E. QUICK (*Read before the Society, September 6th, 1924*).

ON ALBINISM, AND ITS KNOWN OCCURRENCE IN THE EUROPEAN CLAUSILIIDÆ.

By J. DAVY DEAN, F.E.S.

(Read before the Society, September 6th, 1924).

It is generally the rule that a *Clausilia* possessing a true albino shell is itself grey or normal in colour. K. Hurlstone Jones disclaims the idea that such an individual is an albino at all, and draws illustrations in an early paper in this Journal in support of his arguments.¹ Most authors agree that albinism in the shell constitutes a weakness in the animal and J. W. Taylor speaks of it as a morbid condition. He also considers an albino shell borne by a pigmented mollusc as essentially similar to a white feathered or white furred bird or animal.²

White, however, is not without colour in the artistic sense but full of pure reflected tints. An artist, painting a portrait, does not use white paint entirely for the collar of his subject; if he did the collar would not *look* white. Pure touches of red, blue and yellow have first to be used as a base. Now every conchologist knows there is a difference in the degree of whiteness between a var. *alba* and a var. *albicans* of *Helicella virgata* (Da Costa). This difference is due to a degree of colour in the shell. Red, blue and yellow are primary colours and the basis of all colour. Orange, green and purple are known as secondaries, and are a combination of two primaries. Brown is a combination of two secondaries—orange and purple. The white of an albino shell is a prismatic white, reflecting tints of the primary colours in minute quantities. That of an *albicans* is a dead white reflecting also secondary colours. The foliage of a tree is green because it absorbs all rays but green, which colour is the one reflected. An albino shell is white because it reflects all colours. It would appear, therefore, that an albino snail lacks the power to *select* those colours which are natural to the species for the building up of its shell, absorbing none, reflecting all.

Albinism would seem to be of somewhat rare occurrence in the Clausiliidæ. Perhaps the most familiar is the well known species *Marpessa laminata* (Mont.) in which the phase is locally racial, the albino form being taken quite commonly in certain localities. With *Clausilia rugosa* Drap. the case is different for in this

¹ *J. of C.*, vol. viii, p. 3.

² *Tayl. Mon.*, vol. i. p. 89.

species it is very rare to find more than a single specimen in any one colony.¹ I only know of one case of albinism in *Clausilia cravenensis* Taylor, and, even if this name is synonymous with *dubia* Drap., the phase is at any rate rare in this country. Albinos of *Laciniaria biplicata* (Mont.) while frequent on the Continent are also rare here, although J. E. Cooper has taken it on more than one occasion at Mortlake. *Clausilia rolpheii* Gray var. *pellucida* Taylor² is described as colourless and transparent and probably not an albino, as defined above. I have not, however, seen it.

Turning to the Continental species, records appear to be very few. Tabulated, as albinos are, under the term *forma* in the European lists, they do not rank as varieties and are often omitted. But whatever designation they are worthy of, albino Clausilias are among the most beautiful objects in a European cabinet, even if not, scientifically, of great value. And so often are these little shells the reverse of white when picked up that it is very possible to overlook them. Of 509 species listed by Westerland I can only find evidences of albinism in 26 species and some of these are unrecorded. In the hope, therefore, of securing a fuller list I give one of those which seem to be true albinos and shall hope to hear of additions. It is very difficult in the Clausiliidæ to draw any hard and fast line between a white and colourless shell. The term *albina* applied to most of the white forms suggests the semi-transparent satin-white shell which, in a perfect condition, is covered with a thin yellowish-green epidermis. The many species of *Medorella* (*Albinaria*, etc.³) so plentiful in Dalmatia, Greece, Syria, and Asia Minor, are in no sense albinos. Typically, they begin life with a dark purple or brown shell which becomes strongly calcified in order to stand exposure, or through exposure becomes bleached by the sun.

True albinism should begin in the nucleus and be continuous throughout the growth of the shell, but there are also several instances of piebald Clausilias. In *Alopiia madensis* (Fuss.) the last whorl is frequently white. Mr. Tomlin has an *Alopiia deubeli* (West.) in which the first five whorls are normal and the rest of the shell white. There are two specimens in the same collection of *Delima cattaroensis* (Zgl.) in which the last two whorls only are white. In *Delima albocincta* (Pfr.) var. *variata* (Zgl.) the apex is white and the succeeding growth normal to the last whorl, which has a decidedly whitish cast. Mr. Standen has a piebald *Clausilia rugosa* (Drap.) in which the first half of the shell is normal and the rest white.

¹ Mr. Tomlin writes: "In the 'albino' glen at Kinbane Head which Chaster and I discovered together a considerable proportion of the *rugosa* were white, another considerable proportion pale brown, almost unpigmented, and all the rest lighter than usual. Practically all the *Pupilla* there were albino, and other species (incl. slugs) were affected to a less degree."

² *J. of C.*, vol. iv., p. 32.

³ This is the only section in which pure white albinos occur.

SUB-FAM. ALOPIINÆ.

Alopia glauca (Bielz) var. **albina** Bielz.

A. plumbea (Rossm.) var. **albina** Bielz.

A. meschendorferi (Bielz) var. **albina** Bttg.

Albinaria incommoda (Bttg.) var. **alba** Bttg.—Dr. W. T. Elliott has a beautiful example of this variety. The nucleus and the fleckings on the whorls are transparent. The fleckings, usually brown, appear grey against the pure white shell.

A. deglupta (Bttg.). A var. **semialba** Bttg. is described.

Delima cataphracta (Parr.) var. **albina** nov.—I can record three examples from Spalato, Dalmatia: these shells may perhaps be described as satin-white, though somewhat stained with age.

D. pachychila (Klec.) var. **albina** Westerlund.

D. substricta (Parr.) var. **albina** nov.—One shell, satin-white, from the Island of Planchetta, off the Dalmatian coast. An albino of this species does not appear to have been described.

Siciliaria septemPLICATA (Phil.) var. **albina** nov.—Two fine shells of a beautiful satin-white colour in Dr. Elliott's collection. The slight striation gives to the specimens a certain wax-like appearance: sutural zone white.

Papillifera solida (Drap.) var. **albina** Bttg.

SUB-FAM. MARPESSINÆ.

Marpessa laminata (Mont.) var. **albina** Moq.—Gloucestershire is famous for the numerous albinos of this species. I exhibit a



Marpessa laminata (Mont.)
var. **albina** Moq.
(Photo. P. T. Deakin).

fine photograph of two from the Cranham Woods, at Birdlip, taken by Mr. P. T. Deakin.

M. orthostoma (Menke) var. **viridana** West.

Marpessa comensis (Shuttl.) var. **albina** nov.—One shell, satin-white, from Como, Italy.

SUB-FAM. CLAUSILIINÆ.

Clausilia rugosa (Drap.) var. **albina** Moq.

C. dubia (Drap.) var. **albina** Schm.

C. plicatula (Drap.) var. **albina** Menke.

C. ventricosa (Drap.) var. **albina** Schm.

C. cravenensis (Taylor) var. **albina** Dean.—If this is synonymous with *dubia* Drap. then, I take it, Schmidt's name takes precedence. One example at Crosby Ravensworth, Westmorland: shell satin-white, animal pale grey.

C. cruciata Stud. var. **albina** nov.—Shell satin-white. One in Dr. Elliott's collection.

Laciniaria plicata (Drap.) var. **albina** Schm.

L. biplicata (Mont.) var. **albina** Bttg.—This variety occurs at Mortlake, on the Thames. as well as on the Continent.

Pseudalinda montana (Ziegl.) var. **viridana** Zgl.

P. procera (Bielz.) var. **viridana** nov.—Shell greenish-yellow, pale and translucent. One in Mr. Tomlin's collection is from Rosenberg, Upper Hungary. Herr Schmidt has described a var. *albina* of *montana* and there may be connecting links. At present I consider the term *viridana* more appropriately describes this form.

SUB-FAM. FUSULINÆ.

Fusulus varians (Ziegl.) var. **diaphana** Zgl.

F. interruptus (Ziegl.) var. **albina** Küst.

Graciliaria filograna (Rossm.) var. *albina* nov.—One shell, satin-white, from Hungary.

Cyclostoma elegans var. **violaceus** Desm. in Glamorgan.—This is a clear purple shell, devoid of markings and without the usual chalky streaks. I took it some years ago at Silverdale, Lancs., and named it by some continental shells in the late Edward Collier's collection. Mr. J. W. Jackson has, I believe, also taken it in the Furness district. I am pleased to be able to record it in Wales from St. Donat's Castle, on the Llantwit Major Road, in Glamorgan.—
J. DAVY DEAN.

THE MARINE MOLLUSCA OF DINARD.

BY J. WILLIAMS-VAUGHAN.

(Read before the Society, Oct. 25th, 1924).

DINARD on the coast of Brittany is situated close to the mouth of the river Rance and opposite St. Malo. It is a well-known resort of the English. I spent between three and four months there during the spring of 1924 and obtained a considerable number of shells on the beaches of Malouine, St. Enogat and La Prieure, and at St. Lunaire about three miles further south. I give a list of my finds in the hope that they may be of interest and assistance to any one who further investigates that coast. I did no dredging and found all my shells between tide marks. The tides at Dinard rise and fall very much, the difference between high and low water of spring-tides being about fifty feet, and one has to be very careful not to be cut off by the tide when flowing. What struck me very forcibly was how much more the French seaside population makes use of shell-fish as an article of food than we do on our side of the Channel. At every spring-tide about forty or fifty people, men and women, are to be seen hunting for shell-fish, some with rakes turning over the sand and others engaged with hooks extracting the Razor Shells out of the sand and mud. *Solen vagina* is very abundant and a very great number must be collected after every tide. When I first began to collect in February *Venus verrucosa* was very common, but before May they got scarce and I could hardly find any. I have no doubt anybody using a dredge in these waters would soon add considerably to my list of species. I have to thank Mr. Tomlin very much for his great kindness in looking over my shells and naming the species I was doubtful of.

Acanthochites discrepans Brown. One or two living on shells, Malouine.

Craspedochilus cinereus L. Very common on shells and loose stones.

Nucula nucleus L. A few valves much worn at La Prieure and St. Lunaire.

Anomia ehippium L. Living, very common and fine.

Glycymeris glycymeris L. Living on sandy beaches. I took it at St. Malo, and on the St. Enogat beach at Dinard.

Arca lactea L. One, rocks at Malouine.

Mytilus edulis L. var. **galloprovincialis** Lk. Living on rocks at Dinard but not abundant. The patches are generally small.

Modiolus barbatus L. One living and several dead valves.

Modiolus modiolus L. One living on a rock at Malouine.

M. adriaticus Lk. A few dead valves, generally of small size.

Ostrea edulis L. The oyster beds at Cancale, near St. Malo, are renowned throughout France. I found on the Malouine a dead valve with a pearl still attached.

Pecten maximus L. Dead valves.

P. varius L. Not common. Generally dead, one or two alive.

P. opercularis L. Dead valves.

Goodallia triangularis Mtg. Common in shell gravel St. Lunaire.

Lucina borealis L. Scarce, the only specimens I got were very young and small.

Cryptodon flexuosus Mtg. A few dead valves.

Syndosmya alba Wood. Scarce. Two or three specimens.

Scrobicularia plana daC. Dead, but with both valves joined and perfect.

Tellina squalida Pult. Very fine; both valves perfect, but dead.

T. tenuis daC. Scarce.

T. donacina L. One dead valve.

T. crassa Gm. Scarce.

Macoma balthica L. One specimen at Mont St. Michel.

Donax vittatus daC. Rare. One perfect but dead specimen on Malouine and a living specimen at St. Lunaire.

D. variegatus Gm. Dead valves not uncommon at St. Lunaire.

Spisula solida L. Common and much sought after as an article of food.

S. subtruncata daC. Common.

Lutraria magna daC. One fine living specimen; young shells and valves fairly common.

Venus verrucosa L. Common, living at low water of spring tides. Is a favourite with the natives.

V. ovata Penn. Very fine and large at St. Enogat.

V. casina L. One or two valves.

Tapes pullastra Mtg. Scarce: I only got two or three specimens.

T. decussatus L. Of large size and not uncommon on the mud flats at the mouth of the Rance.

T. virgineus L. Common and nicely coloured: one specimen was described by Mr. Tomlin as near the variety *sarniensis*.

T. aureus L. Very common and beautifully marked: when cleaned, the golden colour inside is very distinct.

Cardium exiguum Gm. A few dead valves at La Prieure.

C. nodosum Turt. Not uncommon at St. Lunaire.

C. edule L. Common everywhere.

Cardium tuberculatum L. Several dead valves and one fine living specimen at St. Lunaire.

C. norvegicum Sp. Living and of good size at Malouine and St. Enogat.

Gari depressa Penn. Common, perfect, but dead; one living at St. Enogat.

Mya truncata L. One dead valve.

Corbula gibba Ol. One dead valve.

Solen siliqua var. **arcuata** Jeff. Common and abundant.

S. vagina L. Very abundant.

Barnea candida L. I found several dead valves, it was evidently living somewhere near.

Loripes lacteus L. Dead shells very common. I once came across about twenty, all living, and in a space of about twenty square yards.

Pandora inæquivalvis L. Common, living on all sandy beaches.

Lyonsia norvegica Gm. Two fine shells with both valves, but unfortunately, slightly broken, and one large single valve at St. Lunaire.

Dentalium vulgare daC. Dead shells common. I found three or four living at St. Enogat.

Patella vulgata L. Abundant on every rock between tide marks.

Helcion pellucidum var. **lævis** Penn. Occurs in shell sand at St. Lunaire.

Acmæa virginea Müll. Dead shells common in sand at St. Lunaire.

Emarginula rosea Bell. Shell sand at St. Lunaire.

Fissurella græca L. Dead shells, some large at St. Lunaire and La Prieure.

Gibbula magus L. Abundant and general, living between tide marks.

G. umbilicalis daC. Common everywhere on rocks near high tide mark.

G. cineraria L. Very common.

G. pennanti Ph. Occurs with above two species.

Osilinus lineatus daC. On rocks near the Grotto du Goule de Fées and in other places.

Calliostoma exasperatum Penn. Dead shells, abundant, St. Lunaire.

C. zizyphinus L. Occasionally living on rocks near low tide, Malouine.

Phasianella pullus L. Dead shells plentiful, some of large size, St. Lunaire.

Littorina obtusata L. Common, but generally dull and small.

L. rudis Mat. Abundant, large, near the Rance, some nicely banded.

L. littorea L. Abundant, is much sought after by the natives. I took a large scalariform specimen at low tide, Malouine.

Rissoa parva daC. Abundant.

R. violacea Desm. Abundant.

R. striata Ad. Abundant.

R. membranacea Ad. Common at La Prieure.

R. striatula Mtg. St. Lunaire.

R. lactea Mich. St. Lunaire.

R. costulata Ald. St. Lunaire.

R. cingillus Fbs. Rare at La Prieure.

Barleeia rubra Ad. A few in shell gravel, St. Lunaire.

Calyptræa chinensis L. Living and of good size at Malouine, low tide.

Natica catena daC. Living at Malouine.

Velutina lævigata Penn. One dead shell, Malouine.

Trivia europæa Mtg. Rare; a few dead shells on all beaches.

Bittium reticulatum daC. Abundant; dead at La Prieure, St. Lunaire and Malouine.

Turbonilla lactea L. Scarce; St. Lunaire.

T. pusilla Ph. Scarce; La Prieure.

Buccinum undatum L. Scarce; and when living young and small.

Ocenebra erinacea L. Common, living on rocks at low tide, Malouine and St. Lunaire.

O. aciculata Lk. Two living at lowest verge of spring tide, Malouine.

Purpura lapillus L. Abundant, many varieties of marking and colour, some with broad bands, some narrow, some orange and some pink.

Nassa reticulata L. Abundant; living in the sand near rocks.

N. incrassata Str. Dead shells common, a few living on rocks.

N. pygmæa Lk. Fairly common, generally dead.

Donovania minima Mtg. A few in shell gravel, St. Lunaire.

Bela rufa Mtg. One La Prieure and some in gravel St. Lunaire.

Mangilia nebula Mtg. St. Lunaire, shell gravel.

M. lævigata Ph. St. Lunaire, shell gravel.

Clathurella purpurea Mtg. Malouine and St. Lunaire.

Tornatina obtusa Mtg. One La Prieure near the Rance.

Paludestrina ulvæ Penn. Very abundant, dead, La Prieure

Haliotis tuberculata L. Occurs living on undersides of stones and rocks just below low spring tide mark.

Sepia officinalis L. Bones found occasionally, much worn.

ADDITIONAL NOTES ON THE LAND AND FRESHWATER MOLLUSCA OF SUSSEX.

BY MAUD AND GORDON DALGLIESH.

(Read before the Society, Feb. 6th, 1924).

IN 1915, Mr. E. D. Swanton wrote a most useful paper to the now defunct "Zoologist" on the land and freshwater Mollusca of Sussex, and the following notes must be regarded as a supplement to that paper.

For some years past we have spent our spare time in collecting, mainly in the immediate neighbourhood of Brighton in the east, extending to the country round Midhurst in the west. Special efforts have been made in the search for *Valvata macrostoma* and *Planorbis vorticulus*, both species having been obtained in Malling Marsh, Lewes, and possibly occurring in other localities. But so far our quest has been unsuccessful. We have, however, been able to add two other localities for *Planorbis glaber*. There are many problems regarding the land and freshwater Mollusca that want elucidating. Why, for example, should *Limnæa stagnalis* be entirely absent from some situations that one would have supposed to be eminently suitable for their requirements, and abundant in similar places perhaps only a few miles distant? Why should *Helix hortensis* be absent from the downs where *H. nemoralis* occurs in numbers, and only found in the Weald? Why should the East Sussex race of *Cochlicella barbara* be so much larger and finer than those from the West of England and Wales?

So far as regards the shell, no experienced collector could fail to distinguish *Valvata macrostoma* from *V. piscinalis* or *V. cristata* and we cannot agree with Mr. E. W. Swanton's remarks that "failing anatomical differences it is probably only a variety of a well-known species." The shape and colour distinguish it at once from the other two British species.

Species or varieties enclosed in parenthesis are those that we have not collected ourselves, but which have generously been placed at our disposal by the collectors.

Milax sowerbyi Fér.—Two specimens taken at Henfield in June, 1922.

Vitrina pellucida Müll.—We have always found this species rare. Poynings and Lewes, living, dead shells abundant in a wood near the Race Hill, Brighton.

Vitrea rogersi B. B. Woodward.—Charlton Forest, above Cocking.

Vitrea pura Alder.—Midhurst.

Zonitoides nitidus Müll.—Between Chichester and Bosham.

Euconulus fulvus Müll.—New timber woods, June, 1923, among dead and damp leaves.

Pyramidula rupestris Drap.—Arundel, August, 1922.

Xerophila virgata Da Costa var. *leucozona* Taylor.—Two specimens taken at Withdean in June, 1917.

X. itala Linné (var. *leucozona* Moq.-Tan. and var. *instabilis* Zieg.—Both from Newmarket, P. Arnold).

So far as I am aware these are the first records for Sussex.

X. heripensis Mab.—This species would appear to be as abundant on the Downs near Brighton as *X. caperata* and there can be no doubt that much confusion has arisen among collectors regarding the two species.

(**Theba cartusiana** Müll.)—Mount Caburn, Lewes, but reported as not common and regarded as a waning species.

Cochlicella barbara L.—Abundant and very fine at Saddlescombe and Rottingdean. The largest specimen taken by Mr. H. S. Toms measured 26.75 mm. in length (*Journ. Conch.* vol. xvii, no. ii, July, 1923). Sussex examples, even the smallest, would seem to exceed those from Tenby and Devonshire. It is a hardy species and we have found it active during the winter months. It furnishes abundant food for the starlings.

Hygromia striolata Pfr. var. **rubens** Moq.-Tan.—Stanmer, Newtimber and near the Race Hill, Brighton.

Var. **albocincta** Cockerell.—Falmer.

Acanthinula aculeata Müll.—No doubt widely distributed but difficult to find. Three specimens taken in a hedgebank at Henfield in June 1922.

Vallonia costata Müll.—Lewes, among grass on the Downs.

Helicodonta obvoluta Müll.—West Dean, Chichester, under fallen branches, Bepton Hanger and (Graffham).

Helicigona lapicida Linné.—On stone walls, not common at Easebourne, Midhurst. Bepton Hanger on beech trees, abundant.

Helix aspersa Müll. var. **exalbida** Menke.—Midhurst and Henfield; (Rottingdean, A. F. Brazenor).

(Var. **zonata** Moq.-Tan.—Saddlescombe, H. S. Toms).

Var. **conoidea** Pic.—West Blatchington and Saddlescombe.

Var. **undulata** Moq.-Tan.—Saddlescombe, not uncommon.

Monst. **cornucopiæ** Gmelin.—One in the Brighton Museum from Rottingdean.

The most beautifully marked specimens of *Helix aspersa* have been collected at Saddlescombe and the poorest and coarsest ones—excepting those from the town gardens—on the banks along the road from Brighton to Rottingdean. Here they get the full blast of the winds from the sea, and this probably accounts for their rough and weather-worn appearance. The Saddlescombe specimens, on the other hand, are sheltered from the weather by high banks.

(**H. pomatia** Linné).—Mr. P. Arnold reports a single dead shell from Shoreham.

Helicigona arbustorum Linné.—This must, we think, be regarded as one of our rarer Sussex Mollusca. We found some between Pulborough and Fittleworth. (“Years ago I found *arbustorum* on the high bank just east of the south end of our upper mill pond (Saddlescombe)—below Dyke, willows are near.”—Miss M. Robinson in lit.). (“A very local species; occurs at Harting, and I have found it on both eastern and western sides of Pulborough; also at Cocking near Midhurst. These localities are on high and fairly dry ground. The only other locality I can record is the valley of the Erns, quite on the western border of Sussex. Here it occurs at Lordington, Racton and Westbourne, in damp situations by the stream which reaches the sea at Ernsworth.”—William Jeffrey, *Journ. of Conchology*, iii, p. 305, April, 1882).

Helix nemoralis Linné (var. **coalita** Moq.-Tan.—Stanmer Park, P. Arnold, May, 1915).

Var. **roseolabiata** Kobelt.—West Blatchington, June, 1917.

Var. **flavovirescens** Pic.—West Blatchington.

Var. **fascialba** Pic.—West Blatchington, June 29th, 1917.

Var. **olivacea** Risso, West Blatchington.

Var. **castanea** Moq.-Tan.—West Blatchington, abundant.

Var. **fasciata** Moq.-Tan. and subvar. **mista** B. & B.—West Blatchington.

Var. **fuscolabiata** Taylor.—West Blatchington.

(Var. **bilabiata** Taylor and var. **conica** Pascal.—Bevendean, P. Arnold).

Var. **rubella** Moq.-Tan.—West Blatchington and Midhurst.

Var. **libellula** Risso.—West Blatchington, Midhurst and Cocking.

The finest specimens of *H. nemoralis* were taken on a bank at West Blatchington, where they occur with *H. hortensis* and *Theba cantiana*. Our experience has been that both *Helix nemoralis* and *H. hortensis* have a preference for an easterly or southern habitation.

H. hortensis Müll.

Var. **flaveovirens**.—West Blatchington.

***Helix hortensis* Müll.**

Var. **olivacea** Taylor.—Midhurst.

Var. **griseobrunnea**.—Midhurst.

Var. **tenuis** Baudon.—West Blatchington.

Var. **lutea** Moq.-Tan.—Midhurst and West Blatchington.

Var. **arenicola** Macgill.—Henfield, West Blatchington and Midhurst.

Var. **fuscolabiata** von Martens.—West Blatchington.

Var. **incarnata** Moq.-Tan.—Midhurst and Henfield.

Var. **olivacea** Taylor.—Midhurst.

Var. **lilacina** Taylor.—Midhurst and Henfield.

This last variety we found this year at Henfield particularly fine, and this is perhaps one of the most delicate and beautiful of all the vars. of *hortensis*. Taylor says in his monograph that this variety was found in Yorkshire feeding on the Ground Ivy, *Nepeta hederacea*. The specimens we found at Henfield were on a bank where the grass had been cut, and it was under the piles of wet and half rotten grass where they generally were to be obtained. *H. hortensis* according to our experience is a delicate species and does not like wind and will not be found when a strong or cold wind is blowing. They are never found on the Downs, but only in the Weald and our observations have led us to believe that it is very local in its habitat. At Henfield it was in company with *Arion ater*, *Helix aspersa* and *Helicella cantiana*, but not one *Helix nemoralis* was found there consorting with it.

Ena montana Drap.—Harting Coombe. Three specimens of this rare species taken in 1911. Since then various localities in the neighbourhood have been searched in vain for further specimens. It is, no doubt, like *Helicodonta obvoluta*, very restricted in its habitat.

Azeca tridens Pult.—Lewes and Stanmer Park.

Clausilia laminata Mont. vars. **pellucida** Jeff. and **albina** West.—Charlton Forest, above Cocking.

C. rolpheii Leach.—Bepton Hanger. Beech Avenue, Poynings, among dead beech leaves.

C. bidentata var. **tumidula** Jeff.—Among dead beech leaves at Poynings.

(Var. **gracilior** Jeff.—Near Offham, P. Arnold).

Succinea putris var. **albida** Mörch.—Bramber, May, 1917.

Var. **solidula** Jeff.—Bramber, April, 1923.

Limnæa auricularia Linné.—(Henfield, in river, P. Arnold).

L. palustris var. **roseolabiata** Jeff.—(In the gullies, Shoreham, P. Arnold). Lewes.

Var. **tincta** Jeff.—Up-park.

Limnæa stagnalis* var. *roseolabiata Wolf.—Queen's Park, Brighton and Lewes.

(Var. *labiata* Jeff.—Falmer, May 1923. P. Arnold).

In the ditches round Bramber, *L. stagnalis* is absent, though abundant in exactly similar localities a few miles distant. Its absence at Bramber may be on account of the brackish water, though this does not appear to be detrimental to other species, as *Limnæa glabra*, *Planorbis umbilicatus*, *Valvata piscinalis* and *Bithinia tentaculata* were here in abundance.

Planorbis albus Müll.—New Pond, Midhurst, June, 1919.

P. carinatus Müll.—Malling Marsh, Lewes.

P. glaber Jeff.—Bramber, on roots of Frogbit (*Hydrocharis morsus-ranæ*). (Beeding, Hart Collection, Brighton Museum). In the river at Fittleworth, one specimen, September, 1923.

(*P. umbilicatus* m. *scalariforme* Glynde, P. Arnold).

Segmentina nitida Müll.—On Confervæ in a sluggish stream at Lewes.

Physa fontinalis Linné.—Occurring abundantly with *Segmentina nitida* at Lewes.

(***Paludestrina ulvæ*** Penn.—River Cuckmere, Lewes, P. Arnold, August, 1923).

Valvata cristata Müll.—Very fine and unusually large specimens in a ditch at Bramber.

Hyalinia lucida (Drap.) var. ***obscurata*** Porro.—I cannot find any record of British specimens of this variety. Very characteristic examples frequently turn up however in Cardiff gardens, where the species thrives in suitable corners. The characteristics are the flat, almost sunken, spire and the very much increased breadth of the sutural ridge.—J. DAVY DEAN.

***Helicella heripensis* in Ireland.**—In the *Field Naturalist* for June last, I recorded *Helicella heripensis* Mabilie from a gravel-pit by the railway and canal a little N.E. of Sallins, in Co. Kildare. This record confirms that given in the Society's Census for 1923, which was founded on two dead shells, taken by Mr. E. Stainton on "camp ground, three miles N. of Kildare," on March 14th, 1918. In the *Irish Naturalist* for January, 1922, I criticized the Recorder for reporting the species from Ireland without having seen living specimens, as it seemed possible that Mr. Stainton's shells might have been imported with stores for the army; but my reasons for this criticism now fall to the ground, as not only did I find dead shells in abundance, but also a few living ones at Sallins on April 21st, 1924. As would be expected from the very dry habitat—a Glacial gravel-mound—the form of the shell found was a very small one. It was associated with *H. itala* and *H. virgata*; but I did not see any *H. caperata*. From the evidence available I was not able to come to a conclusion whether the shell was an introduction or a native.—A. W. STELFOX.

NON-MARINE MOLLUSCA OF PORT ST. MARY, ISLE OF MAN.

By W. H. HEATHCOTE.

(Read before the Society, November 7th, 1923).

THE greater part of the last summer was spent at Port St. Mary, Isle of Man, during which I was able to devote a few evenings and one whole day to our favourite pursuit. The weather was most unfavourable for collecting, being exceedingly dry and mostly cold, and there was only one really wet spell of short duration, during the nine weeks. That evening brought out a number of fine *H. nemoralis*, a species I particularly wanted to find. Through the kindness of Mr. Murray Gawne, I was able to search the woods and river at Kentraugh. These are very dense and as a consequence—in the lower parts at any rate—moist and damp, but very gloomy, making the smaller species difficult to see.

With the exception of a brief visit to Port Erin, my observations were made entirely in the vicinity of Port St. Mary, while the entire absence of ponds makes the aquatic list a comparatively short one. In all 39 species and 43 vars. were collected.

Limax maximus Lin.—Fairly common and some of large size.

L. flavus Lin.—A few in damp outhouses.

Agriolimax agrestis (Lin.).—Everywhere.

A. lævis (Müll.).—On trees in Kentraugh Woods.

Milax sowerbyi (Fér.) var. *bicolor*, amongst road sweepings on road side, Kentraugh.

Vitrina pellucida (Müll.).—Very small, in Kentraugh Woods.

Vitrea crystallina (Müll.).—Kentraugh.

V. (Polita) lucida (Drap.).—Under stones, Kentraugh.

V. (P.) cellaria (Müll.).—Abundant.

V. (P.) allaria (Miller).—One under stone in wood.

V. (P.) nitidula (Drap.).—Abundant.

V. (P.) pura (Alder).—One in Kentraugh.

Euconulus fulvus (Müll.).—Kentraugh Woods.

Arion ater Lin.—Common everywhere, mostly variably coloured, notably vars. *albolateralis* and *bicolor*, not many of type form.

A. hortensis Fér.—Common under stones and twigs.

Pyramidula rupestris (Drap.).—A few on narrow wall at Kentraugh.

P. rotundata (Müll.).—Everywhere; a few very large specimens in the entrance to ancient Ice House at Kentraugh; the vars. *pyramidula*, *grisea* and *major* occurred.

Helicella caperata (Montagu).—A few found only by removing stones to a good depth on the shore at Gausey Beach

H. barbara (Lin.).—I found surely the metropolis of this species on the shore at Kentraugh, with all stages of growth, but the type form was entirely absent, the dominant forms being the varieties *strigata* and *articulata*. I took four specimens of a unicolorous violet-brown without any trace of "whitish transparent ribs" (var. *nigrescens* J. W. T.). These I sent in to Mr. J. W. Taylor for his opinion. They were lost in the post and the only satisfaction I can get is "cannot be found in this office."

Hygromia hispida (Lin.).—Almost the whole series I took were var. *hispidosa* with a few vars. *subrufa*, *albocincta* and *alba*.

H. striolata Pfr.—Common and of a very clean, thin form on walls, etc., at Kentraugh, along with vars. *albolabiata*, *rubens*, *albocincta* and *alba*. A few of these from Gausey beach were very like *itala* and might easily be taken for that species.

Vallonia pulchella (Müll.).—One under stone on Gausey Beach.

Helix aspersa Müll.—This species literally swarms everywhere, from high up the hill down to high water mark. I found several on the shore at Kentraugh, on the very edge of the grass and herbage where it joined the shingle. From the few I collected I picked out the following varieties: *nigrescens*, *undulata*, *flammea*, *albofasciata*, *zonata*, *obscurata*, *puncticulata*, *clathrata* and *fasciata*. A curious dwarf crinkly form was confined to the coarse grass and herbage at the foot of a house wall in the village itself. This species is a great traveller; I noticed one big chap climbing the wall from the garden in rear of the house; it remained on the under side of the window head of the pantry for a day. The following morning it was in a similar position at the bathroom window, twenty feet from the ground. Here it remained for three days and then I noticed its slime track almost straight up the remainder of the wall and on to the slates. On getting on the roof I found it at the foot of the chimney stack on the ridge tiling. I never saw it again. The ridge is a favourite resting place for the numerous herring gulls.

H. nemoralis Lin.—Only taken on one very wet evening on the roadside wall and short grass at Kentraugh, all of large size and some very diaphanous, of the *rubella* form with vars. *albolabiata*, *bimarginata* and *fascialba* 00300. The natives here call them "The Lady Snail."

Cochlicopa lubrica (Müll.).—Kentraugh, with vars. *exigua* and *lubricoides*.

Pupilla anglica (Fér.).—Woods at Kentraugh. With the reddish mouthed type I took a few of a pale horn-colour, with pure white lip and denticles. I have never seen Jeffreys' var. *pallida*, which

Adams gives as "whitish." This hardly describes the variety; *cornea* would be a much more appropriate name. Adams says this species has a great partiality for the moss *Hypnum cuspidatum*, but in this locality that species is absent, the predominant moss being *Hypnum* (*Eurhynchium*) *prælongum* with *Hyp. cupressiforme*, *Mnium hornum* and *undulatum* and the Hepatic *Lophocolea bidentata*.

P. cylindracea (Da C.).—Common on walls and tree stumps at Kentraugh, with vars. *curta*, *edentula* and one with two small denticles.

Clausilia bidentata (Ström).—Very abundant on the walls and trees, etc. at Kentraugh; very clean, unweathered and variable in shape; one decollate specimen and one with a curiously distorted mouth.

Succinea pfeifferi Rssm.—Plentiful on the rank herbage and ground of a nearly dried up mill dam at Gausey.

Carychium minimum Müll.—A few in Kentraugh Woods.

Ancylus fluviatilis Müll.—I first noticed this species on the sides of a great concrete tank on the quayside at Port Erin; this is supplied from water trickling down the cliff. The shells were very clean and mostly of good size and all var. *albida*; a few vars. *stricta* and *gibbosa* occurred. This latter var. is usually found in swift, clear streams! In the Kentraugh river they were scarce and small, of a very dark colour.

Limnæa pereger (Müll.).—All I saw of this species were mostly very small, the finest and cleanest of an olive-brown colour, living in what is practically a swamp a few hundred feet above the sea, near The Chasms. A few very small in Kentraugh river.

Planorbis crista (Lin.).—The only species of this genus I saw, a few with the var. *lævigata* on dead sycamore leaves in Kentraugh river.

Valvata piscinalis (Müll.).—The most abundant mollusc in the Kentraugh river, the bed being in suitable places thickly encrusted with them: mostly of large size and beautifully clean. There must be some abnormally large ones as I found an operculum in my dredge which measured 3.5 mm. Many of the shells are very strongly ribbed. I took one small var. *albina* and a couple with distinct whitish bands.

The last day of my stay, at the request of Mr. C. Oldham, I devoted to a search in the river for *Pisidium* and with good results, taking the following five species, which I have placed in the order of their relative abundance.

Pisidium nitidum Jenyns.—Of these, Stelfox says "all are rather depauperate *nitidum*, such as one usually gets in a small river with softish water."

P. subtruncatum Malm.—Plentiful.

Pisidium casertanum (Poli).—Two large and several small ones.

P. milium (Held).—A few in the river and one in the mill dam.

P. personatum Malm.—One specimen of this swamp dwelling species in the river, which Stelfox says "is rather a curious shell, very *nitidum* shaped, with unusually strong striations, probably washed into the river when young and grown up there."

Nearly all the species taken, both Land and Freshwater, were very clean and unweathered, which is somewhat remarkable considering the dry, windy weather.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

530th Meeting, held at the Manchester Museum, September 6th, 1924.

The President, Mr. Wilfrid Jackson, M.Sc., F.G.S., in the chair.

Candidates Proposed for Membership.

Charles J. Mogridge, Ivy Cottage, West End, Fareham, Hants. (introduced by R. Standen and J. W. Jackson).

V. A. G. Brown, Fawley Lodge, Coley Avenue, Reading (introduced by J. R. le B. Tomlin and G. C. Spence).

Arthur Blok, B.Sc., A.M.I.E.E., 45, Plympton Road, London, N.W. 6.

The Hon. Lionel Lindsay, M.C., B.Sc., F.Z.S., 47, Westbourne Terrace, London, W. 2. (both introduced by J. C. Dacie and J. E. Cooper).

Resignations.

Dr. W. G. N. Van der Sleen. H. E. J. Biggs. R. T. Hindley.

Member Deceased.

A. D. R. Bacchus.

Papers Read.

"*Neritina fluviatilis* L. in Wales," by G. A. Martin.

"An Islet Fauna," by Rev. L. W. Grensted.

"Length of Life of *Paludestrina ulvæ*," by Capt. H. E. Quick.

"*Vertigo angustior* in Glamorgan," by Capt. H. E. Quick.

"On Albinism, and its known occurrence in the European Clausiliidæ," by J. D. Dean.

"The Occurrence of *Valvata piscinalis* f. *alpestris* in Scotland," by the late Dr. N. Annandale.

"Obituary Notice of Arthur Douglas Bacchus," by H. Womersley.

Principal Exhibits.

By Mr. J. Davy Dean: Specimens from his own collection, from that of Dr. W. T. Elliott, and that of J. R. le B. Tomlin, to illustrate his paper.

By Mr. A. E. Ellis: A living *Arion ater* v. *succinea*, sub.-var. *melanocephala*, from Bagley Wood, Berks.

By Mr. R. C. Moore and Miss Moore: *Zirphæa crispata* from Hilbre Island, Wirral, Cheshire

By Mr. C. J. Mogridge: Large example of *Cypræa pantherina* v. *theriaca* Melv. (Size 107 × 64 mm.).

LAND MOLLUSCA ON THE MEWSTONE.

BY A. E. ELLIS.

(Read before the Society, May 3rd, 1924).

ON March 30th, 1924, a party of zoologists paid a visit to the Mewstone, an island rock situated on a ledge running out from the west side of the Wembury Bay, near Plymouth, and completely isolated from the mainland at all times. A thorough search of the whole rock was made by Mr. O. W. Richards and myself, with the result that the following mollusca were recorded:—

Limax arborum, *Milax gagates*, *Polita cellaria* (dead shells), *P. alliaria* (frequent, most of the specimens being var. *viridula*), *P. nitidula*, *Arion intermedius* (rather dark in colour), *Pyramidula rotundata* (chiefly a dark shelled form=*subrufula* Pascal, without markings, frequent), *Helicella virgata*, *H. caperata* (a large form, frequent), *H. caperata* var. *ornata*, *H. caperata* var. *fulva* (these two varieties much scarcer than the typical form), *Cepæa nemoralis* (vars. *castanea* 00000, *libellula* 00000, 12345, (123)45, *rubella* 00300, 12345—all about equally common), *Helix aspersa* (fragments of shells only), *Clausilia bidentata* (abundant on the steeper side of the island), *Lauria cylindracea* (abundant), *Littorina neritoides* (just above high water mark). The chief plants on the Mewstone are *Beta maritima*, *Urtica dioica*, *Silene maritima*, *Matricaria inodora*, *Sambucus nigra*, and various mosses and lichens.

A short time was also spent in examining the coast opposite the Mewstone. At the west side of Wembury Bay, two feet beyond high tide mark of spring tides, were found under stones at the edge of the shingle: *Milax gagates*, *Agriolimax agrestis*, and *Arion hortensis*; and on herbage slightly further up: *Helix aspersa* and *Cepæa nemoralis*. *Talitrus*, *Orchestria* and other maritime animals were associated with these slugs near high tide mark. Further up, *Helicella virgata* (and var. *lutescens*), *H. caperata* (of medium size), *Polita nitidula*, *P. alliaria*, *Milax gagates*, and *Lauria cylindracea* were frequent. At Rum Bay, west of Wembury, a yard above extreme high tide, were found: *Agriolimax agrestis*, *Polita cellaria*, *Vitrina pellucida*, *Arion intermedius*, *Pyramidula rotundata*, *Clausilia bidentata*, *Lauria cylindracea*, *Cochlicopa lubrica*, and further down, on the shingle amongst dried *Fucus*, *Helicella caperata*, var. *ornata* and numbers of *Hygromia hispida*, under stones. Between this place and Wembury were found *Limax arborum*, numbers of *Cepæa*

nemoralis pairing, *Pyramidula rotundata* (the unicolorous form, similar to that on the Mewstone), *Arion ater* var. *succinea* (under stones amongst *Radicula nasturtium-aquaticum* in a marshy stream) and *Succinea putris* (on a stone in a stream flowing into Wembury Bay, at extreme high tide limit).

There is thus some difference between the fauna of the Mewstone and that of the nearest mainland, indicating possibly that the rock became isolated before such forms as *Agriolimax agrestis*, *Arion hortensis*, and *Helix aspersa* (the two broken shells found on the island were probably dropped there by birds) had reached that part of the country. These three species, now common on the coast of Devon, would appear to be more recently established than the others mentioned above, and to be still extending their range, possibly largely assisted by the spread of cultivation. If once introduced on the Mewstone they would probably thrive as well as any of the species at present occurring there, as conditions on the rock do not differ appreciably from those obtaining on the coast opposite, where these species are found in company with "Mewstone forms." The large size of the Mewstone race of *H. cæperata*, as compared with those on the mainland, would seem to indicate that conditions of existence on the island are even more favourable than on the neighbouring coast, at any rate to that species; and I do not think the absence of forms so common on the coast can be attributed to lack of suitable environmental conditions, but to their arrival in South Devon subsequent to the isolation of the Mewstone from the mainland.

MOLLUSCA IN THE NEIGHBOURHOOD OF MARKET HARBOROUGH.

By A. E. ELLIS.

(Read before the Society, February 6th, 1924).

MARKET HARBOROUGH lies just within the border of Leicestershire, but much of the neighbouring country is in the county of Northampton. The formation of most of the Leicestershire part of the district is Lias, but there are considerable areas of Lower Oolite (Northampton Sand) towards the south-east. The district within half-a-dozen miles of Market Harborough embraces two streams, the Welland and the Ise, part of the Grand Junction Canal, two large reservoirs, at Saddington, Leics., and Welford, Northants., and several woods and copses; at Desborough, Northants., there are ironstone quarries, and there are over thirty miles of railway embankment. All these have

their characteristic molluscan fauna. In addition there are gardens and extensive areas of pasture and arable land, which are not lacking in interest to the conchologist, although not rich in species. The following are examples of these various types of habitat :

In the river Welland, in which the chief plants are *Nymphaea lutea*, *Fontinalis antipyretica*, and algæ, are found (April, 1922)

<i>Limnæa pereger</i>	<i>P. carinatus</i>
<i>L. stagnalis</i>	<i>P. vortex</i>
<i>Ancylus fluviatilis</i>	<i>P. leucostoma</i>
<i>Acroloxus lacustris</i> (on <i>Nymphaea</i>)	<i>P. contortus</i>
<i>Physa fontinalis</i> (some specimens 13.5 mm. in height)	<i>Valvata piscinalis</i>
<i>Planorbis albus</i> (on <i>Nymphaea</i> , attaining a breadth of 9 mm.)	<i>Bithynia tentaculata</i>
<i>P. umbilicatus</i>	<i>Sphærium corneum</i>
	<i>Pisidium amnicum</i>
	<i>Pisidium</i> sp.

On the banks of the Welland, where the most prominent plants are *Glyceria fluitans*, *Veronica beccabunga*, *Scrophularia aquatica*, *Urtica dioica*, *Cardamine hirsuta*, *Glyceria aquatica*, and *Rumex*, occur

<i>Succinea elegans</i> (maximum height of shell 9.5 mm.), chiefly on <i>Scrophularia</i> and <i>Rumex</i>	<i>Hygromia striolata</i>
<i>Agriolimax lævis</i>	<i>Arion intermedius</i>
<i>A. agrestis</i>	<i>Limnæa truncatula</i> , crawling on wet mud.

A tributary of the Welland on the Northamptonshire side contains *Limnæa pereger* and *Paludestrina jenkinsi* (the shells of which I have also found in the river rejectamenta), and another tributary stream on the Leicestershire side has *Limnæa pereger* and *Planorbis vortex*, while on its banks, where grow *Urtica dioica*, *Rumex*, *Dactylis* and *Poa*, are found *Limnæa truncatula*, *Succinea elegans* (height of shell 8.5 mm.)—these two in association on the algæ-covered mud—*Cepæa hortensis* and *Vallonia excentrica* (on drier ground).

In the rejectamenta of the Welland I have found *Aplexa hypnorum*, *Polita cellaria*, *Vitrea crystallina*, *Cepæa nemoralis*, *Hygromia hispida* v. *albocincta*, *Helix aspersa*, *Hygromia striolata*, *Cochlicopa lubrica*, *Pyramidula rotundata*, *Vallonia*.

In the canal at Foxton, Leics., occur (1922) :

<i>Limnæa pereger ovata</i> (maximum height of shell 29 mm.)	<i>Valvata piscinalis</i>
<i>L. auricularia</i> (up to 34 mm.)	<i>V. cristata</i>
<i>L. stagnalis</i>	<i>Vivipara vivipara</i>
<i>Planorbis corneus</i>	<i>Bithynia tentaculata</i>
<i>P. carinatus</i>	<i>Physa fontinalis</i>
<i>P. umbilicatus</i>	<i>Dreissensia polymorpha</i> , on stones, Unionid shells and woodwork.

<i>Planorbis vortex</i>	<i>Unio pictorum</i>
<i>P. crista</i> (of small size), on <i>Potamogeton</i> .	<i>U. tumidus</i>
<i>P. fontanus</i>	<i>Anodonta cygnea</i> (unusually short in proportion to height).
<i>P. albus</i> , on <i>Nymphæa</i> and <i>Potamogeton</i> .	<i>Sphærium rivicola</i>
<i>Acroloxus lacustris</i>	<i>S. corneum</i>
<i>Ancylus fluviatilis</i>	<i>Pisidium amnicum</i> (there are several other species of this genus).
<i>Theodoxus fluviatilis</i> (maximum length of shell 11 mm.)	

On the banks of the canal are *Succinea putris*, *S. elegans* and *Zonitoides nitidus*; the last lives in very moist places, amongst *Galium palustre* and other water plants, often in company with *Planorbis vortex*, and frequently submerged. *Vitrea crystallina* occurs here too.

Before leaving the aquatic mollusks mention may be made of a few isolated ponds, which are interesting chiefly from the point of view of means of dispersal. A pond in an old quarry on Clack Hill, at 408 feet, over 100 feet above the nearest stream a quarter of a mile off, and nearly two miles from the canal, contains *Planorbis umbilicatus*, *P. crista*, *P. vortex*, *Limnæa pereger*, and *Sphærium corneum*. In a cattle-pond two fields away from the Welland, and above the flood level, occur *Planorbis vortex*, *Limnæa pereger* and *Sphærium corneum*. In a similar pond in an adjacent field are *Planorbis vortex* and *Limnæa pereger*, while in a pond two fields away and at a higher level only *Limnæa pereger* is found. As far as I can see birds must be held responsible for most, if not all, of these importations.

The richest wood in molluscan life in the neighbourhood is Brampton Great Wood, on the Oolite, in which the dominant trees are oak and hazel; a few beeches also grow here and there in the wood, and the dead leaves at the foot of these are particularly rich in the smaller species; other habitats are under rotting logs and amongst moss.

The list from this wood is (April, 1923):

<i>Limax maximus</i>	<i>Pyramidula rotundata</i>
<i>L. arborum</i>	<i>Acanthinula aculeata</i>
<i>Agriolimax agrestis</i>	<i>Cepæa nemoralis</i> v. <i>rubella</i> 12345
<i>Vitrea pellucida</i>	<i>C. nemoralis</i> v. <i>rubella-undulata</i>
<i>Vitrea crystallina</i>	12345
<i>Polita cellaria</i>	<i>C. hortensis</i> v. <i>lutea</i> 12345
<i>P. rogersi</i>	<i>Ena obscura</i>
<i>P. alliaria</i>	<i>Clausilia laminata</i>
<i>P. nitidula</i> (and var. <i>nitens</i>)	<i>C. bidentata</i>
<i>P. pura</i>	<i>Columella edentula</i>

<i>Polita pura nitidosa</i> (in equal numbers with the type)	<i>Hygromia hispida</i>
<i>P. radiatula</i>	<i>Arianta arbustorum</i>
<i>Euconulus fulvus</i>	<i>Cochlicopa lubrica</i>
<i>Arion ater</i>	<i>Azeca menkeana</i>
<i>A. subfuscus</i>	<i>Carychium minimum</i>
<i>A. intermedius</i>	<i>Punctum pygmæum</i>
<i>A. circumscriptus</i>	<i>Acicula lineata</i>

In the neighbouring Brampton Little Wood, separated from the Great Wood by a grazing field, there were noted in April, 1922 :

<i>Agriolimax agrestis</i> v. <i>reticulata</i> , the normal form in this district.	<i>Clausilia bidentata</i>
<i>A. agrestis</i> v. <i>pallida</i>	<i>Vitrina pellucida</i>
<i>A. lævis</i> (at the roots of <i>Deschampsia cæspitosa</i>)	<i>Polita cellaria</i>
<i>Limax maximus</i>	<i>P. nitidula</i>
<i>Vitrea crystallina</i>	<i>Euconulus fulvus</i>
<i>Polita rogersi</i>	<i>Pyramidula rotundata</i>
<i>P. pura</i>	<i>Hygromia hispida</i>
<i>Arion ater</i> v. <i>marginella</i>	<i>Arianta arbustorum</i>
<i>A. ater</i> v. <i>rufa</i>	<i>Cepæa nemoralis</i>
<i>A. ater</i> v. <i>castanea</i>	<i>Cochlicopa lubrica</i>
<i>A. hortensis</i>	<i>Azeca menkeana</i>
<i>A. circumscriptus</i>	<i>Vertigo pygmæa</i>
<i>A. intermedius</i>	<i>Helix aspersa</i> (one dead shell)
<i>A. intermedius</i> v. <i>plumbea</i>	<i>Limnæa truncatula</i> (in an open drain running through the wood).

In a wood near Sibbertoft, Northants., where the dominant trees are oak and elder, I recorded in April, 1923 :

<i>Limax arborum</i>	<i>Limax maximus</i> vars. <i>cellaria</i> and <i>sylvatica</i>
<i>Agriolimax agrestis</i>	<i>Polita cellaria</i>
<i>Vitrea crystallina</i>	<i>P. nitidula</i>
<i>Polita alliaria</i>	<i>P. pura</i>
<i>P. radiatula</i>	
<i>Arion ater</i> (young specimens are pale in colour, resembling var. <i>alba</i> , but appear to become darker when adult ; this seems to be the case in shady and humid localities generally)	
<i>A. intermedius</i> (and v. <i>plumbea</i>)	<i>Arion hortensis</i>
<i>A. circumscriptus</i>	<i>Punctum pygmæum</i>
<i>Pyramidula rotundata</i>	<i>Acanthinula aculeata</i>
<i>Hygromia hispida</i>	<i>Cochlicopa lubrica</i>
<i>Cepæa nemoralis</i> v. <i>libellula</i>	<i>C. lubrica</i> v. <i>albina</i>
<i>C. nemoralis</i> v. <i>rubella</i> (pale form)	<i>Carychium minimum</i>
<i>Columella edentula</i>	

In a small open oak-wood near Arthingworth, Northants., in April, 1923, I noted: *Arion ater*, *A. circumscriptus*, *A. hortensis*, *Punctum pygmæum*, *Euconulus fulvus*, *Polita radiatula*, *P. rogersi*, *P. alliaria*, *P. nitidula*, *Columella edentula*.

In a marsh at Maidwell, Northants., in which the dominant plants are *Salix*, *Urtica dioica*, and *Glyceria aquatica*, the following species were observed in October, 1923:

<i>Agriolimax agrestis</i>	<i>Carychium minimum</i>
<i>A. lævis</i>	<i>Cochlicopa lubrica</i>
<i>Euconulus fulvus</i>	<i>Polita cellaria</i>
<i>Vitrea crystallina</i>	<i>P. alliaria</i>
<i>Punctum pygmæum</i>	<i>P. radiatula</i>
<i>Pyramidula rotundata</i>	<i>P. nitidula</i>
<i>Arion intermedius</i>	<i>P. pura</i> v. <i>nitidosa</i>
<i>Arianta arbustorum</i> and v. <i>flaves-</i>	<i>Arion ater</i>
<i>cens</i> , on nettles; in dry weather	<i>A. hortensis</i>
only the young individuals were	<i>Clausilia bidentata</i>
to be seen.	<i>Limax maximus</i>

Cepæa nemoralis v. *libellula* 12345

Associated with *Agriolimax lævis* and *Euconulus fulvus* (unusually large specimens) on the lower parts of the leaves and stems of the *Glyceria*, were *Limnæa truncatula*, *Succinea putris* (a small-sized race, averaging about 9 mm. in height of shell) and immense numbers of *Vertigo antivertigo*. In the large pond, into which this marsh drains, occur *Limnæa pereger* v. *ovata*, *L. stagnalis*, and *Anodonta cygnea*. On the wall bounding the locality *Vallonia excentrica* and *Clausilia bidentata* occur.

In an Oolitic quarry at Desborough in July, 1922, were recorded:

<i>Agriolimax agrestis</i>	<i>Vallonia excentrica</i>
<i>Polita cellaria</i>	<i>V. costata</i> (slightly more abundant than the <i>V. excentrica</i> with which it lives in association)
<i>Arion hortensis</i>	<i>Cochlicopa lubrica</i>
<i>Helicella itala</i> (and v. <i>charpentieri</i>)	<i>Vitrea crystallina</i>
<i>H. virgata</i> (and v. <i>lutescens</i>)	<i>Polita nitidula</i>
<i>H. caperata</i>	<i>Pyramidula rotundata</i>
<i>Hygromia hipsida</i> (and vars. <i>albocincta</i> , and <i>globulosa</i>)	<i>Ena obscura</i> (one dead shell)
<i>H. striolata</i> (all specimens from the neighbourhood of Market Harborough are var. <i>albocincta</i>)	<i>Pupilla muscorum</i>
<i>Theba cantiana</i> (shells white, faintly tinged with red near the aperture, especially below the periphery; all the specimens are var. <i>albocincta</i>).	

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New Members, Resignations and Deaths will be found in the Proceedings, pp. 120-128, 159-160, 186.

Neritina fluviatilis L. in Wales.—Where the Glamorganshire canal passes the Castle grounds on the east side; there is just inside the east gate an overflow from a lock. This again empties into the dock feeder below and fills and empties as each barge passes the lock. The above species occurs sparingly on the loose stones at the bottom of this small pool, or overflow, in company with *Limnæa pereger*, *L. stagnalis*, *Physa heterostropha*, *Planorbis corneus* and *Sphærium corneum*. Mr. J. Davy Dean tells me there is an old Swansea record for *N. fluviatilis*, in M.S. by Spence Bate in a copy of Dillwyn's "Materials for a Fauna and Flora of Glamorgan" in the National Museum, but which record has never been confirmed.—G. A. MARTIN (*Read before the Society*, Sept. 6th, 1924).

THE DISTRIBUTION OF MARGARITANA MARGARITIFERA IN THE BRITISH ISLES.

By J. WILFRID JACKSON, M.Sc., F.G.S.

(Presidential Address delivered at the Annual Meeting, October 25th, 1924).

PLATE 2.

PART I.

Margaritana margaritifera (L.), the well-known freshwater pearl mussel, is of peculiar interest on account of its enormous range and its antiquity. It has the most extensive distribution of any Naiad known. The origin of the species is somewhat obscure, but that it is a very ancient one is gathered from the fact that it is found in widely separated areas in Europe, Asia, and North America. In the first-named continent it inhabits northern Portugal (north of latitude 40°); N.W. Spain; the Pyrenees; Central and N.W. France; the British Isles (except the E. and S.E. of England); Iceland; Scandinavia (including Lofoten Islands); Denmark (Jutland); Lapland; possibly also the Volga watershed, the Don, and the Dnieper, in Russia; Germany; Bohemia; Belgium; and probably Holland. In Asia it is met with in the Amur Region, Eastern Siberia; in the Island of Saghalin; and in Kamtchatka. There is also the possibility of its occurrence in Northern and Southern Siberia (Yenisei Region, Altai, etc.), but here authentic data are wanting as to species. In America it occurs in the western river systems from Alaska (Naha Bay, lat. $55^{\circ} 35'$ N.) south to about latitude 35° N., and in the eastern river systems from Labrador¹ south to latitude 40° N. In addition it is recorded from the Lower Saskatchewan River, near Lake Winnipeg, Canada.² It will be seen from this distribution that the species appears to be entirely circumpolar, but it should be pointed out that it only inhabits certain limited areas where peculiar and special conditions are present.

Numerous species have been made of this abundant and widespread form, but there appears to be no real justification for their recognition, and, as emphasized by Bryant Walker, though the species has spread nearly, if not quite, round the globe through an enormous period of time, it "has preserved its peculiar characters and specific identity to a remarkable degree. The essential similarity of the species as it exists at the present time on the different continents is very remarkable, and indicates that its persistent specific characters were well established before its long migration was begun."

¹ The Labrador citation has been questioned on the ground that it was based on hearsay only; but the species has recently been recorded from the neighbourhood of Hopedale, Labrador, it having been collected there by the Rev. W. W. Perrett, of the Moravian Mission (see *The Naturalist*, October 1st, 1924, p. 311).

² A full and complete record of its distribution in North America is given by Bryant Walker in the *Proceedings of the Malacological Society*, vol. 9, part 2, June, 1910, pp. 127-145.

The foregoing facts are of special interest in connexion with the original home of the species and the question of the means whereby the form attained its present wide distribution.

It is not my intention to enter into a detailed description of the pearl mussel; this may be obtained from any reliable text-book. What I more particularly wish to consider are a number of special points which appear to me to have some bearing upon its dispersal. A few remarks upon certain other details will also be included on account of their peculiar interest. The data relating to the British distribution of the pearl mussel will then be reviewed. In a future portion of this Address (part ii.) I am dealing with the past history of the species.

For many years I have been accumulating material relating to the freshwater pearl mussel and in the course of this study I have had the privilege of examining specimens of this species from most of the British localities, as well as from places on the Continent and in America. The larger portion has been from the British Isles, and I am indebted to numerous friends for the loan, and in some cases the gift, of many specimens for the purpose of this study. Among those deserving of special mention are Dr. R. F. Scharff, who kindly allowed me to examine the Dublin Museum collection; Professor W. M. Tattersall, who arranged for me to see the series belonging to the Fisheries Branch of the Department of Agriculture of Ireland;¹ and Mr. R. J. Welch, M.Sc., M.R.I.A., for numerous notes and specimens. I have also received assistance in one form or another from the following: Professors J. H. Ashworth and A. E. Boycott, Messrs. R. A. Phillips, C. Oldham, A. W. Stelfox, A. S. Kennard, H. Coates, G. A. Frank Knight, C. N. Bromehead, W. H. Heathcote, J. R. le B. Tomlin, J. F. Musham, B. B. Woodward, J. W. Taylor, J. A. Hargreaves, A. K. Lawson, Captain W. J. Farrer, and Surgeon-Commander K. H. Jones, R.N. To all these helpers I wish to tender my grateful thanks.

In addition to this help from friends I have carried out an exhaustive research into the literature dealing with the subject and extracted many data dealing with British distribution. In many cases this proved disappointing as some works contained little more than a reference to a particular river in a certain county as being the habitat of the pearl mussel. This is to be regretted, as much more information is required regarding habits and habitats.

One of the most remarkable and important peculiarities controlling the distribution of the pearl mussel is its restriction in waters deficient

¹ These two cases, as well as others, provided several records for the Roebuck Memorial Census (*J. Conch.*, vol. 16, 1921), the late W. Denison Roebuck having seen the specimens when in my possession.

in lime salts. This fact has been disputed on more than one occasion, but experiments in colonization carried out by various observers have shown how extraordinarily sensitive the pearl mussel is as regards water rich in lime. Dr. F. Haas¹ records that he kept several specimens of the pearl mussel alive for nine months in Heidelberg water destitute of lime, but, on placing them in water from Frankfurt-on-Main containing comparatively little lime, they all died in a few hours. Von Hessling² also refers to experiments carried out in several rivers in Bavaria, but the survival of colonies placed in hard waters of the streams proved a failure in each case.

Experiments in our own country have met with no better success. K. McKean³ placed 150 specimens from the Don in Aberdeenshire into the hard, chalky Wandle at Hackbridge in Surrey; 52 were taken out dead within a week, and none survived long.⁴

This remarkable characteristic of the pearl mussel in relation to habitat is clearly brought out from a close study of its British distribution. As will be seen from the map and the data accompanying this Address, the species is entirely absent from the Midland Plain and the South-Eastern parts of England, where the rivers have hard water. It is also absent from the great limestone plain of Central Ireland.

Another remarkable feature is the extraordinary thickness of the shell, a feature which is usually associated with an abundance of lime. Yet, notwithstanding the restriction of the pearl mussel to non-calcareous waters, it possesses the peculiar faculty of abstracting sufficient carbonate of lime from the limited supply in order to build up its thick shell.

The dearth, however, of calcium carbonate in rivers tenanted by the pearl mussel carries with it another important factor linked with the welfare of the species, viz., the superabundance of carbonic acid. This powerful solvent acts injuriously upon the substance of the shell, attacking more particularly the older parts such as the umbonal regions. In live shells the beak areas, possessing a thinner periostracal covering, are liable to sustain abrasion while the shells are ploughing through the sandy and stony bottom of the habitat. Once this periostracal covering is pierced, erosion sets in and continues throughout the life of the animal. The amount of erosion, however, varies considerably in different rivers. In old examples it is

¹ Proc. Malac. Soc., vol. 9, part 2, June, 1910, p. 109.

² Von Hessling, *Die Perlmuscheln und ihre Perlen*, Leipzig, 1859.

³ Proc. Croydon Micro. and Nat. Hist. Club, 1882-3, p. 145 (*vide* A. E. Boycott, Trans. Herts. Nat. Hist. Soc., vol. 17, Oct., 1919, p. 25). See also T. D. A. Cockerell, *Zoologist* (3), vol. 9, March, 1885, p. 96.

⁴ Since this Address was given, Dr. A. E. Boycott has sent me the results of his experiments with specimens from the R. Wye, Hereford. Rather than incorporate them here, I prefer to treat them as an appendix under Dr. Boycott's name.

often found to extend over the whole umbonal region, and to form deep pits or cavities, which clearly show the different layers of the shell. In other specimens, equally old and of large size, the erosion has affected little more than the beaks.

According to A. E. Boycott and E. W. Bowell,¹ the pearl mussels found in the River Wye around Hereford are nearly always badly eroded. It is pointed out by these observers that in some cases they are "eroded right through the shell; sand, etc., then enters the hole, but this is soon skinned over by the mollusc, and consequently a hard mass—frequently of considerable size—of agglutinated sand and mucous material is to be found blocking up the hole. Various stages in the process may be seen; from the case where the sand has merely a skin between it and the shell, to examples whose shells shew on their interior hard lumps in which the sand is thoroughly impregnated and bound together with secretion. It is in the last degree unlikely that these examples of perforated shells are due to fracture rather than erosion."

Many other localities could be cited where similar eroded examples have been noted.

Dead shells are similarly attacked and may be found in all stages of dissolution, eaten away by the solvent action of the acidulated water, leaving finally nothing but the periostracum.²

The species is apparently very sensitive to drought, as A. E. Boycott reports³ that he made four attempts to send it alive through the post, but in each case the examples were dead on arrival. *Anodonta cygnea* and *Unio pictorum* seem to travel quite successfully and will survive out of water for several days; they live in localities which are apt to go dry. The rivers frequented by the pearl mussel do not dry up, and the species is evidently not adapted to withstand drought. More information, however, is needed on these points.

The nature of its habits renders its occurrence in a satisfactory fossil condition improbable⁴; but the periostracum of the species has been observed in the Holocene deposits of the Clyde in the Glasgow neighbourhood. It was recorded from there in 1866 by James Bennie⁵, who mentions the discovery of 67 shell-skins in river-drift of the Clyde at Windmillcroft. Some of the shell-skins had belonged to single valves, in others the periostracum of both valves was flattened together, but in all cases the shelly matter had been dissolved by the action of percolating water. Further specimens in the same condition were obtained in 1916 from the ancient bed of the

¹ Boycott & Bowell, Woolhope Naturalists' Field Club, Trans., 1898, pp. 98-99.

² See Shrubsole, re Upper Dee at Llanderfel, N. Wales, in *J. Conch.*, vol. 5, p. 70.

³ Proc. Malac. Soc., June, 1921, p. 130.

⁴ See A. S. Kennard, Proc. Malac. Soc., June, 1923, p. 245.

⁵ Trans. Geol. Soc., Glasgow, vol. 2, 1866, p. 109.

Clyde in digging the foundations of the Dalmarnock Power Station.¹ There is also a specimen in the Greenock Museum which was dug up in 1869 from about 12 inches deep in the bed of the River Gryfe, at Kilmalcolm, Renfrew.²

In North Wales an imperfect valve of the species was found in a sepulchral cave of Neolithic age at Perthi Chwareu, near Llandegla, Denbighshire.³

In North America fossil occurrences of the species are reported by Bryant Walker and others.⁴

As in the case of *Anodonta* and other of our Naiads, the occurrence of the pearl mussel is conditioned by the presence of fish on which the parasitic phase of its development is achieved; but more information is needed with regard to the special type of fish necessary to act as efficient hosts. There appears to be a preference for certain species. C. B. Wilson⁵ asserts that the trout is the natural host; but W. Harms⁶ got the best infection on minnows. The latter authority reports that in the River Ruwer, a tributary of the River Moselle, only a few species of fish occur along with the pearl mussel. The most abundant appears to be the minnow, and at the time of the expulsion of the fry of the pearl mussel, he has found even young examples of this fish to be infested, to the exclusion of the other fishes except the bullhead. Harms carried out infection experiments on the minnow in the laboratory and found that in a very short time the gills of these small fishes were filled with the glochidia, five to six or more being attached to each gill-filament.

Judging from the distribution of the pearl mussel, there must be several other kinds of fish which act as hosts for the glochidia. In our islands the bullhead appears to be absent from Scotland and Ireland,⁷ though the pearl mussel is widely spread in these countries. The distribution of the minnow, also, does not coincide exactly with the distribution of the pearl mussel.

The glochidia, or fry, of the pearl mussel, whose development takes place in the inner and outer gills of the parent,⁸ are apparently without true hooks.⁹ They possess six or seven small teeth only: there is thus less security of attachment than in the case of the hook-bearing glochidia in *Unio* and *Anodonta*. They are extremely tiny, their diameter being 0.0475 mm. (in *Anodonta*, 0.35 mm.; in *Unio*,

1 Trans. Geol. Soc., Glasgow, vol. 16, 1916, p. 108.

2 Proc. Roy. Phys. Soc. Edin., vol. 10, 1891, p. 498.

3 Lancs. Naturalist, 1913, p. 321, (This was originally recorded as *Mya truncata*, Journ. Ethnol. Soc., Lond., 1871, p. 443).

4 Bryant Walker, *op. cit.*, p. 142.

5 Bulletin of the Bureau of Fisheries, vol. xxxiv, Document No. 824, 1916, p. 347.

6 Harms, Zool. Anz., vol. 31, 1907, pp. 821-2.

7 Guide to British Freshwater Fishes (Brit. Mus. Publication), 1917, p. 35.

8 Harms, *op. cit.*, 1907, pp. 802, etc.; Harms, Zool. Jahrb., Bd. 28, 1909, pp. 331-2. (In *Anodonta* and *Unio* the eggs develop only in the outer gills).

9 Harms, *op. cit.*, 1909, pp. 334-5.

0.29 mm.), and are inhaled by fishes and become attached to the gills, as in *Unio*, and not to the fins, as in *Anodonta*. In a very short time (2-4 hours) the glochidia become shut in by a thick cyst. The pearl mussel is thus liable to wide dispersal, but whether this would extend beyond the limits of one river-system is not known. More observations regarding the duration of the parasitic stage may furnish us with the necessary information on this important point. One would like to know also if the glochidia are parasitic on the salmon, as the matter is of special interest when one remembers that most, if not all, of the rivers inhabited by the pearl mussel, in the British Isles at least, are also salmon rivers. However, it is possible that the breeding-seasons of the two may not coincide, and the salmon may have migrated to the sea, when the pearl mussel is in spawn. The bullhead and minnow are not migratory fishes and do not move far in the particular rivers which they inhabit. This may account to some extent for the occurrence of restricted and isolated colonies of the pearl mussel in some rivers.

The period of spawning of the pearl mussel and the question of temperature at such times are further points which require elucidation. The information at present available seems to be that breeding takes place normally in July and early August. According to Harms,¹ the fecundation of the pearl mussel begins about the middle of July; Von Hessling gives the end of July as the commencement of the breeding-time, so that the observations of these two authorities agree fairly well. Schierholz,² on the other hand, states that he found young pearl mussels in full-breed at the end of May. In the larger examples, however, he found no trace of spawn, the gills in these giving him the impression that they had ceased to function as brood-pouches. The observations of Harms,³ however, disprove Schierholz' statement that large examples do not participate in the propagation of the species, since he has found the larger and older animals producing ripe eggs equally with the younger.

The development of the egg up to the ripe glochidium resembles in general that of *Unio pictorum* and *Anodonta*; the eggs, however, are much smaller, and *Margaritana* produces a much greater quantity in one season than the other two forms. The duration of a single brood is about 16 days in very warm weather, but may extend to about four weeks if the temperature is cold. Unlike *Anodonta*, the ripe glochidia have not been found to be retained in the gills of the parent over the winter.⁴

¹ Harms, *op. cit.*, 1907, p. 818; Harms, *op. cit.*, 1909, p. 332.

² Schierholz, Denks. d. kais. Akad. d. Wiss. math.-naturw. Classe, Bd. lv., Abth. ii, 1888, p. 188.

³ Harms, *op. cit.*, 1907, p. 818.

⁴ Id. 1909, p. 332. (*Unio* eggs develop in 4-6 weeks, and those of *Anodonta* in two months, as a rule).

The duration of the parasitic state on the gills of fishes also appears to depend largely on temperature; it may be prolonged to four or five weeks; but as a rule occupies about 14 or 15 days. The larvæ then leave the host and fall to the bottom of the river and have henceforth to look after themselves.

The very young shells are seldom obtained in the natural habitat. I have only seen four examples which came from the River Conway, at Llanrwst. These were briefly described by R. Standen, in 1909.¹ The specimens, which measure 9.5, 12, 15.7 and 19 mm. in anterior-posterior diameter, are interesting as showing the details of the beak-sculpture very clearly; the smallest possesses bold concentric folds over two-thirds of the beak, and radial markings (ridges) on the hinder third. In the interior the lateral lamellæ are well developed for such small shells. These lamellæ ultimately disappear, which is one of the chief characteristics of the species. In some individuals, even when fairly well-grown, traces of these lamellæ are to be found.

Another characteristic of the species is the presence of a number of small punctations about the middle of the interior of each valve. These are mantle muscle scars. They are never absent; but appear to vary in number. The colour of the nacre is also a variable feature, it being purple, bluish, and sometimes salmon.

There is a considerable difference in the size of the specimens obtained from the various stations in the British Isles. The largest that I have seen are from the Glencar River, Co. Kerry; these measure from $5\frac{1}{2}$ to $6\frac{1}{4}$ inches from the anterior to the posterior end. Others from the west of Ireland (Delphi, Co. Mayo; Connemara and Dawros River, Letterfrack, Co. Galway) approximate very closely to these lengths. Elsewhere in the British Isles, four to five inches is a common occurrence. The Irish examples are quite as large as the specimens quoted by Von Hessling from northern Bavaria.² Some of the smallest full-grown examples are from the River Wye, Hereford.

The pearl mussel seems to be very susceptible to the action of light, for under the full blaze of the sun it emerges more out of the gravel and protrudes a portion of the mantle through the partly opened valves. If the sun becomes overcast, or the water above the shell muddied, the mantle is withdrawn and the shell-valves close.³

A low temperature does not appear to be detrimental to the welfare of the pearl mussel, as Middendorff⁴ reports its occurrence in most mountain streams on the European coast of the Arctic Ocean in which the summer temperature reaches only about 13°C . (-55.4°F).

¹ Standen, *Lancs. Nat.*, July, 1909, p. 109, and fig. 10.

² Von Hessling, *op. cit.*, p. 92.

³ John Dixon, *The Naturalist*, i, 1865, pp. 81-2.

⁴ Middendorff, in "Sibirische Reise," Bd. ii, Thl. i, 1851, pp. 427-8.

Its range in altitude seems to be a large one, as the species occurs in habitats ranging from very little above sea-level up to a height of 7,400 feet (in California).¹

Few detailed observations on the habitat of the species appear to have been made in the British Isles, most collectors having been content with merely collecting the shells and recording them. A. E. Boycott and E. W. Bowell,² perhaps, give us the most information with regard to its habits and habitat. They report that the species is very abundant in the rapid parts of the River Wye round Hereford, "where there is a more or less sandy bottom, in from one-and-a-half to four or five feet of water: it seems to prefer a depth of about three feet. Deep holes and muddy localities with but a sluggish stream of water it does not seem to affect much. It is often found in especial abundance in the shoal water at the head of the rapids, where the bottom consists of fairly large stones, the interstices being filled with sand and fine gravel." They further state that "it is easiest taken in the early part of the year (March, April), when it moves into quite shallow water near the bank. At such times they may be seen crowding the beds of the little sandy bays which often occur at the foot of a beach. Here they move about freely, and their long, curving tracks are very conspicuous on the bottom." These tracks form a very nearly regular circle, and, from various data, it is estimated that from 12 to 15 feet is an average day's journey. When resting, the shell is held in an almost vertical position, or sunk deeper into the bed of the river, and the marks of the various stoppages are clearly visible on the tracks. The species does not bury so much of its shell as e.g. *Anodonta*; this may be correlated with the usually harder bottom of the habitat.

In the River Lune, at Caton, about five miles above Lancaster, the species occurs in much the same way as in the Wye, though the river normally runs smoothly but swiftly, and exhibits none of the turbulent character usually associated with the habitat of the pearl mussel. The shells may be obtained quite easily in normal years by simply wading in. They occur in groups, on the sheltered sides of large stones, half buried in hard sandy gravel. Their semi-circular tracks, punctuated by frequent stoppages, are clearly seen in the bed of the river.

Similar observations have been made on the continent. F. Haas³ reports that in the Steinach, a mountain stream in Western Germany, he finds the pearl mussel only in the stony places, where small rapids ruffle the surface of the water. The shells occur stuck 10 cm. in the

² Walker, *op. cit.*, p. 142.

³ Boycott & Bowell, *op. cit.*, pp. 98-99.

¹ Haas, *Nachr.-Blatt d. Deutsch. Malac. Gesell.*, Supplement, 1908, p. 12.

bottom at an angle of about 50° . The lower margin is towards the current, so that transported organic particles may be easily inhaled by the siphon. Large clusters of *Fontinalis* occur attached to stones and the pearl mussel has a predilection for collecting under these.

According to Harms,¹ who has studied the pearl mussel in the Ruwer, the species occurs most abundantly in the mill-streams situated at various places along the river; these are the natural breeding-places. They also occur in the main river in the neighbourhood of the natural and artificial stone weirs, generally three or four together on the shady side. They are usually deep in the sand with only 2 to 5 cm. sticking out, with the long axis of the shell at an angle of 25° to 45° . Their chief position is behind stones, which serve to break the strength of the current. When the fry is ready for expulsion (from the end of July to the end of August) the mussels distribute themselves over the whole width of the river. The glochidia are expelled within a few days, the mussel frequently changing its position. The young larvæ are thus given the greatest possible chance of reaching the fish in order to carry out their parasitic development.

Pearl-fishing in British rivers appears to have been an established industry long before the Roman Conquest, and frequent references to British pearls are to be found in Roman writings of the first and second century A.D. According to Suetonius ("Lives of the Cæsars"), the great motive of Cæsar's expedition into Britain in 55 B.C. was to obtain its pearls, which, it is reported, were so large that he used to try the weight of them by his hand.² Pliny³ confirms this search for pearls, saying that Cæsar dedicated a breastplate covered with British pearls to Venus Genetrix, and hung it in her temple at Rome.

One of the most famous rivers in Britain for pearls in ancient times was the Conway in North Wales. It is in the higher parts of the river, above Trefriw, that the best pearls have been found. Robert Garner,⁴ in a paper read before the British Association in 1856, says, the true pearl mussel is found plentifully about a mile above the ancient bridge of Llanrwst, near the domain of Gwydir, where the water is clear, rapid, and deep, and it may be had hence up to Bettws-y-Coed. It was probably from the first spot that Sir Richard Wynne (of Gwydir) obtained the pearl which he presented to the queen of Charles the Second.

¹ Harms, *op. cit.*, 1907, pp. 814, etc.

² May there not be some confusion here with the pebbles of stream-tin found in Cornish rivers?

³ Pliny, "Nat. Hist.," Bk. ix, ch. 57.

⁴ Garner, Report Brit. Assoc., 1856, pt. ii, p. 92. (This paper, by the way, contains references to marine and non-marine shells around Gt. Orme's Head, not often quoted).

Thomas Pennant,¹ writing in the 18th century, also mentions the Conway, and speaks of as many as sixteen pearls having been taken in a single shell. The pearl mussels are called by the Welsh Cregin Diluw (Deluge Shells), as if left there by the flood.

Another celebrated pearl-river is the Irt in Cumberland, where the famous circumnavigator, Sir John Hawkins, had a patent for fishing that river. Camden, in his "Britannia," mentions the pearl mussels of the Irt and states that "the shell-fish having by a kind of irregular motion taken in the dew, which they are extremely fond of, are impregnated, and produce pearls." This appears to have been a prevalent belief in many places in early times.

In the 12th century there was a market for Scotch pearls in Europe, and in A.D. 1355 pearls from that country are referred to in a statute of the goldsmiths of Paris. The Tay in Perthshire seems to have been, and still is, the most famous of the Scottish rivers.²

In Ireland pearl-fishing appears to have been of some importance in the 17th century. One of the earliest references is that of Solomon Richards, who in his description of Co. Wexford about 1656, speaks of the Slaney River as preceding all the Irish rivers for its pearl-fishing.³ Another early reference to Irish pearls is that of Sir Robert Redding, who, in 1693,⁴ sent specimens of pearls to Dr. Lister which had been obtained from the river near Omagh, Co. Tyrone. He further stated that there were four rivers in this county abounding in pearl mussels, all emptying themselves into Lough Foyle. They were also to be found in other rivers in Co. Donegal, a river near Dundalk, the Shure by Waterford, and Lough Lean in Co. Kerry. The pearl-fishery at Omagh is evidently of some antiquity, as it is reported that pearls from there were sent by Gilbert, Bishop of Limerick, in 1094 A.D., to Anselm, Archbishop of Canterbury.⁵

Apart from its contained pearls, the pearl mussel has no economic value except that in some places the body is used as bait in crab- and cod-fishing. Many boat-loads are said to be taken from the Ythan, near Aberdeen, and employed in the cod and ling fishing off Peterhead.⁶ On the continent it is apparently used to fatten ducks and pigs.⁷ In the Isle of Man, the valves have been utilised as scoops and as porridge spoons,⁸ and in some places in the British Isles the highly polished valves have been employed in the manufacture of fancy purses.

¹ Pennant, "British Zoology," vol. iv, 1777, p. 80.

² See Kunz and Stevenson, "The Book of the Pearl," 1908, pp. 159-168, for an interesting account of the British Pearl Fisheries.

³ Kunz and Stevenson, *op. cit.*, p. 162.

⁴ Phil. Trans. Roy. Soc., for 1693, vol. xviii, No. 198, pp. 659-663.

⁵ M. S. Lovell, The Edible Mollusca of Gt. Britain and Ireland, 2nd Ed., 1884, p. 72.

⁶ G. Johnston, Intro. to Conchology, 1850, p. 29.

⁷ Von Hessling, *op. cit.*, p. 103.

⁸ John Dixon, The Naturalist, i, 1865, pp. 81-2.

LOCAL DISTRIBUTION IN THE BRITISH ISLES.

The distribution of the pearl mussel is given under the Comital and Vice-Comital Areas as in the Roebuck Memorial Census (*J. Conch.*, vol. xvi, June, 1921, pp. 165-212). This is not altogether a satisfactory method, as in some cases the habitat is in a river which divides two counties, hence a single record may appear twice over. Some such system as river basins might have served the purpose better.

ENGLAND AND WALES.

CORNWALL, E.—River Tamar, exactly at junction with River Ottery, 2 adult, dead, C. N. Bromehead; River Tamar, Lt. H. J. Kelsall (in. B. Mus. coll.); River Camel and Tamar, Jonathan Crouch ("A Cornish Fauna, etc.," Truro, 1841, p. 32).

DEVON, S.—River Teign, near Dunsford Bridge, W. S. M. D'Urban, 29-7-76., 12 spec. (In. Exeter Mus., no. 306 of Catalogue). (See also E. Parfitt in "The Naturalist," vol. 4, July, 1854, p. 152); River Plym, near Plymouth, Miss S. S. Bolton ("The Naturalist, vol. 3, June, 1853, p. 130); Rivers Yealm, Avon and Dart (W. E. Leach, "A Synopsis of the Moll. of G. B.," 1852, p. 322).

DEVON, N.—R. Torridge, about 1½ miles above Torrington, C. R. C. Hibbert, 25-7-99; River Torridge, near Coham Bridge, not far from Black Torrington, C. R. C. Hibbert, 10-8-99; River Taw, at Newbridge, near Bishops Tawton, H. Beeston and C. E. Wright (*J. Conch.*, xi, July, 1904, p. 81); River Exe, near Tiverton (W. E. Leach, *op. cit.*, p. 322).

GLOUCESTER, W.—River Wye, near Staunton, A. E. Boycott, 1913 (*J. Conch.*, vol. xiv, 1914, p. 223).

MONMOUTH.—River Wye, A. E. Boycott, 1913.

HEREFORDSHIRE.—River Wye, round Hereford and elsewhere, Boycott and Bowell (Trans. Woolhope Naturalists' Field Club, 1898, pp. 98-99).

GLAMORGAN.—River Ely, Mr. Wotton, 1891 (Brit. Assoc. Handbook, Cardiff, 1891, p. 181); Swansea Canal (Jeffreys, Brit. Conch., vol. i, 1862, p. 38).

CARMARTHEN.—River Towey, at Llanarthney, T. W. Barker, 1902 (fide J. W. Taylor); River Teify at Maesycrugiau, near boundary between Carmarthen and Cardigan (fide J. W. Taylor).

PEMBROKE.—River Cleddau, C. G. Barrett, May 1888 (fide J. W. Taylor).

MERIONETH.—Trawsfynydd, J. B. Morgan, Sept., 1888 (J. W. Taylor, *J. Conch.*, vi, April, 1889, p. 86, as Montgomeryshire, but

corrected *in litt.* 1919); River Dee, from Bangor Isycoed to Bala (G. W. Shrubsole. Proc. Chester Soc. N. H., pt. 3, 1884; *J. Conch.*, v, July, 1886, p. 70, etc.; Thos. Ruddy, *J. Conch.*, v, April, 1887, p. 184).

CARNARVON.—River Conway, about a mile above the ancient bridge of Llanrwst, near the domain of Gwydir, and thence up to Bettws-y-Coed (R. Garner, Brit. Assoc. Rept for 1856, p. 92).

DENBIGH.—River Conway, near Llanrwst, many observers (see Carnarvon).

LANCASHIRE, W.—River Lune, Caton, near Lancaster, D. Dyson, 1841; R. Standen, 1887; J. W. Jackson, 1903; etc. [Specimens from this locality, or from the Conway, were introduced into Sankey Brook, at Warrington, many years ago, but it is not known how long they survived].

LANCASHIRE, N.—[Var. *olivacea*, River Leven, a little below Windermere, Thos. Glover (Capt. Brown, Illus. L. and F. W. Conch., G. B. and I., 1845, p. 115, pl. xxiii, fig. 1)].

YORKS., N.E.—River Esk, near Lealholme Bridge, H. Crowther, 1878; Cruckley Gill, H. Crowther, 1879 (H. Pollard, "Naturalist," May, 1887, p. 137); [River Derwent, Scarborough, W. Bean (W. Nelson and J. W. Taylor, Trans. Yorks. Nat. Union, 1877, p. 15)].

YORKS., MID. W.—[Sparingly in River Nidd at Ripley, F. R. Fitzgerald, *J. Conch.*, vi, Jan., 1889, p. 18].

DURHAM.—[Formerly found in plenty in River Browney; near Bearpark, N.W. of Durham; habitat destroyed by pollution (B. Hudson, *J. Conch.*, v, Jan., 1888, p. 259)].

NORTHUMBERLAND, S.—River Reed (Rede on maps), above Otterburn (Joshua Alder, Trans. Tyneside Nat. F. Club, 1848, p. 83; W. D. Sutton, *J. Conch.*, i, 1874, p. 23); in the river at West Woodburn, coll. Howse (*vide* J. W. Taylor, in litt., 26-2-1919).

WESTMORLAND.—River Lowther, J. C. Smith (C. Soc. Cabinet, *J. Conch.*, vi, Oct., 1891, p. 391); [var. *minor*, River Mint, near Kendal (Capt. Brown, Illus. L. and F. W. Conch., G. B. and I., 1845, p. 115, pl. xxiii, fig. 2)]; [river at Ambleside, 1835 (Maria Glover, *J. Conch.*, xi, Oct., 1906, p. 372)].

CUMBERLAND.—River Greta, at Keswick, River Derwent and Chapel Beck, Bassenthwaite, W. J. Farrer (*J. Conch.*, viii, Jan., 1896, p. 161); var. *arcuata*, River Derwent. below Ouse Bridge, Bassenthwaite (Capt. Brown, *op. cit.*, 1845, p. 115, pl. xxiii, fig. 3); River Irt, Holmrook, C. Oldham, June, 1920, W. J. Farrer, 1911, etc. (the Irt is referred to by many writers).

ISLE OF MAN.—Black River, near Kirk Bradden Church (Edward Forbes, "Malacologia Monensis," 1838, p. 45).

SCOTLAND.

DUMFRIES.—[River Clouden, pearls only, Edinburgh Museum]; River Clouden, near Dumfries (R. Rimmer, L. and F. W. Shells of B. I., 1880, p. 16); a specimen in R. Standen coll., stated to come from this place, and collected by Peace in 1865, is a typical *Pseudunio auricularius* (Spengler) (= *sinuatus* Lam.). See *J. Conch.*, vol. xiii, Jan., 1911, pp. 142-3.

WIGTOWN.—River Cree and Malzie Burn, Mochrum, J. G. Gordon, 1909 (W. D. Roebuck, *The Scottish Naturalist*, Dec., 1916, p. 296).

AYR.—River Doon, A. Brown (Kelvingrove Mus.); River Doon, from under "Brig o' Doon," A. Shaw, 1889 (R. Standen coll.); Girvan Water, near Girvan, collected in the "seventies" by Robt. Gray (W. D. Roebuck, *The Scott. Nat.*, Jan., 1918, p. 22).

RENFREW.—River Gryfe, near Kilmalcolm, a single specimen from 12 inches down in river-bed, 1869 (Greenock Museum), (W. D. Roebuck, *Proc. Roy. Phys. Soc.*, Edin., vol. x, 1891, p. 498).

LANARK.—River Clyde, Glasgow, A. Shaw, 1888 (R. Standen coll.); River Clyde, Bothwell, A. Brown (Kelvingrove Mus.); River Clyde, Cambuslang, T. Scott (W. D. Roebuck, *Proc. Roy. Phys. Soc.*, Edin., vol. x, 1891, p. 498). See also fossil occurrences mentioned earlier.

STIRLING.—"Stirlingshire" without precise locality, Andrew McLellan, 1893 (*J. Conch.*, vol. vii, 1894, p. 367); "Loch Lomond" (Von Hessling, *op. cit.*, p. 186).

PERTH, W. and CLACKMANNAN.—Trossachs, T. Rogers, 1874 (Roebuck, *Proc. Roy. Phys. Soc.*, Edin., x, 1891, p. 498); River Teith, Callander (R. Standen coll., etc.); River Teith, near Donne, A. Brown (Kelvingrove Mus.); River Forth (Edinburgh Mus.); River Balvaig, Strathyre (J. W. J. coll. ex W. H. Heathcote); River Balvaig, at Balquhiddar (J. W. J. coll., ex G. A. Frank Knight); River Allan (Von Hessling, *op. cit.* p. 186).

PERTH, MID.—River Tummell, T. Peace, 1867 (R. S. coll.); River Tay, Perth (various collections); Loch Tay, T. Peace, 1865 (R. S. coll.); River Tay, Aberfeldy, J. Leslie, 1909 (Perth Mus.); River Lyon, T. Scott (Roebuck, *Proc. Roy. Phys. Soc.*, Edin., x, 1891, p. 498); River Earn, Bridge of Earn (Perth Mus.); River Farg, at mouth, J. Caw, 1894 (Perth Mus.); Dochart stream at Killin (Von Hessling, *op. cit.*, p. 186).

PERTH, E.—River Tay, Dunkeld, J. Carphin (*J. Conch.*, vol. vii, 1893, p. 130); River Tay, Delvine, G. Mallock, 1893 (Perth Mus.).

FORFAR.—River Pow, Kinnard House Farm, half-mile from South Esk, W. Duncan (W. D. Roebuck, Proc. Roy. Phys. Soc., Edin., vol. x, 1891, p. 498); River Esk (Edinburgh Mus.); Kirriemuir (J. T. Musham coll.).

KINCARDINE.—River Dee, near Park, Prof. J. Arthur Thomson (J. W. J. coll., ex Prof. J. H. Ashworth). See also Aberdeen, S.

ABERDEEN, S.—River Dee, near Aberdeen (R. S. coll.); River Dee, near Aboyne, C. N. Bromehead; River Don, Waterton, near Aberdeen, P. R. Shaw, 1890 (R. S. Coll. and C. Oldham coll.).

ABERDEEN, N.—Rivers Ythan, Ugie, and Doveran (=Deveron), (Macgillivray, Hist. Moll. Animals of Aberdeen, Kincardine, and Banff, 1843, pp. 242-3). River Ugie, F. Booth, 1910 (The Scot. Nat., Dec., 1913, p. 275).

BANFF.—River Spey, near Aberlour, J. C. Smith, 1890 (Conch. Soc. Cabinet), (see also Science Gossip, 1891, p. 21, and *J. Conch.*, vi, 1891, p. 391); River Isla (Von Hessling, *op. cit.*, p. 186).

ELGIN.—River Spey, near Craigellachie, L. Dawes; River Spey, at Nethybridge, G. A. Frank Knight; River Lochty or Black Burn, Geo. Gordon.

EASTERNESS.—River Spey, at Kincaig by Kingussie, W. Evans, 1890 (Roebuck, Scot. Nat., April, 1917, p. 95; Proc. Roy. Phys. Soc., Edin., x, 1891, p. 498); River Glass (Von Hessling, *op. cit.*, p. 186).

MAIN ARGYLE.—Loch Awe, G. A. F. Knight; River Orchy, near entrance to Loch Awe, A. Somerville, 1866 (Roebuck, Scot. Nat., Sept., 1916, p. 237).

ROSS, W.—River Kerry, near Gairloch, F. Booth, 1910 (Scot. Nat., Dec., 1913, p. 275); Digiscaig Burn, two miles from Poolewe, R. Cameron.

ROSS, E.—River Conon, J. W. Vaughan, 1910; Strathpeffer, near Dingwall, F. R. Fitzgerald, 1886 (J. W. J. and R. S. Coll.).

SUTHERLAND, E.—Rivers Brora and Helmsdale, W. Baillie (*J. Conch.*, iii, 1882, p. 299).

SUTHERLAND, W.—Near Stair Point, Assynt, W. Baillie, 1883; River Inver and River Kirkaig, near Lochinver, G. A. F. Knight; River Naver, W. Baillie (*J. Conch.*, iii, 1882, p. 299).

CAITHNESS.—“River of Wick, rather plentiful,” C. W. Peach (*J. Conch.*, iv, 1884, p. 226).

HEBRIDES.—River Lindale, Loch Roag, Lewis, F. M. Dyke, 1918, (Roebuck, Scot. Nat., Dec., 1918, p. 284).

SHETLAND.—[This record is based on specimens in the Edinburgh Museum, presented by Fleming as from "Zetland" (*fide* J. W. Taylor, *in litt.*, 1919)].

IRELAND.

LONDONDERRY.—River Ballinderry, near Coagh, R. J. Welch, 1914 (J. W. J. coll.).

ANTRIM.—River Bush, Bushmills, W. A. Green, 1901 (Dublin Mus.); River Bush, Bushmills, A. W. Stelfox, 1902; River Bann, near Portglenone, formerly common (*fide* R. J. Welch).

DOWN.—Upper River Bann, near Banbridge, formerly common (*fide* R. J. Welch).

ARMAGH.—River Kilcurry, P. H. Grierson, 1904. (See also Louth).

TYRONE.—River Mourne, Newtownstewart, J. N. Milne, 1905 (Dublin Museum and J. W. J. coll.); River Strule, four and seven miles below Omagh, 1909 (Fisheries Branch, Ireland); River Canowen, about three miles above Omagh, 1909 (Fisheries Branch, Ireland); River Derg, near Castlederg (*fide* R. J. Welch); River Mourne, near Strabane, Sion Mills and Victoria Bridge (*fide* R. J. Welch).

DONEGAL, E.—River Finn, near Strabane (*fide* R. J. Welch).

DONEGAL, W.—River Clady, Bunbeg, A. W. Stelfox (Irish Nat., March, 1906, p. 66); Lough Fern, near Milford, J. N. Milne, 1909 (Conch. Soc. Cabinet).

FERMANAGH.—"Little Bridge River," Rev. S. Brennan (Dublin Mus.).

CAVAN.—River Annalee, near Cootehill (Fisheries Branch, Ireland).

LOUTH.—River Kilcurry (above Dundalk), dividing Louth and Armagh, P. H. Grierson, 1904.

DUBLIN.—River Liffey, near Lusan, R. F. Scharff, 1894 (Dublin Mus.).

KILDARE.—River Liffey, near Ballymore Eustace (Fisheries Branch, Ireland).

WICKLOW.—Kings River, near Blessington, H. M. Winder (Dublin Mus.); River Aughrim, R. F. Scharff, 1893 (Dublin Mus.); Rivers Avoca and Slaney (Von Hessling, *op. cit.*, p. 188).

WEXFORD.—River Bann (tributary of River Slaney), 1883 (Dublin Mus.); River Slaney, Waller coll. (Dublin Mus.); River Slaney, at Enniscorthy, R. A. Phillips, 1911 (R. S. and J. W. J. coll.).

CARLOW.—Borris, R. F. Scharff (Dublin Mus.); River Barrow, near Borris, P. H. Grierson, 1903. See also Killkenny (Ullard).

KILKENNY.—River Barrow, Ullard, P. H. Grierson, 1903; see also Carlow (near Borris).

SLIGO.—River Moy, above the weirs at Ballina (Miss Amy Warren, in "The Zoologist," 1879, p. 28). See also Mayo, E.

MAYO, E.—River Moy, near Foxford (Lovell, "Edible Brit. Moll.," 1884, p. 72); River Moy, above the weirs at Ballina (Miss Amy Warren, in "The Zoologist," 1879, p. 28). See also Sligo.

MAYO, W.—River Bundorragha, between Pass of Delphi and "Great Killary (Fiord) Harbour," R. J. Welch, 1898 (Dublin Mus. and J.W.J. coll.); river at Newport? (Miss Amy Warren, in "The Zoologist," 1879, p. 28).

GALWAY, W.—River Dawros, Letterfrack, A. L. Massy, 1902 (Fisheries Branch, Ireland); Connemara, T. W. Warren (Dublin Mus.); near Oughterard (*fide* R. J. Welch).

TIPPERARY, S.—River Suir, near Clonmel, dividing this county from Waterford, A. H. Delap (Proc. Roy. Ir. Acad., 2nd ser., iv, No. 6 (Science), 1886, p. 692).

WATERFORD.—River Clodiagh, at Portlaw, J. R. le B. Tomlin; Coolfinn [=? Portlaw] (Dublin Mus.).

CORK, E.—River Blackwater, near Fermoy, E. Stainton, 1917; near Mallow, R. A. Phillips, 1907.

CORK, MID.—River Lee, Inniscarra, R. A. Phillips, 1903.

CORK, W.—Lough Lua (? Allua) (Von Hessling, *op. cit.*, p. 188); River Lee and River Sullane, near Macroom, P. H. Grierson, 1903; Owenacahina Stream, flowing from Barley Lake to Glengariff River; also in latter river and River Coomerkane, K. H. Jones, 1911 (*J. Conch.*, xiii, 1912, pp. 288-9).

KERRY, S.—Parknasilla, E. M. Tatlow (Dublin Mus.); River Blackwater, near Parknasilla, dead specimen picked up by A. W. Stelfox, 1899 (Irish Nat., Sept., 1907, p. 288); River Glencar, near Lough Caragh, 1906 (Dublin Mus.); River Owenmore, above Cloghane, Dingle Promontory, A. W. Stelfox, 1914 (Irish Nat., Feb., 1915, p. 33); Lough Lean (Redding, Phil. Trans. Roy. Soc., vol. xviii. (1693), pp. 659-663).

APPENDIX BY DR. A. E. BOYCOTT, F.R.S.

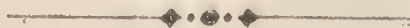
A VISIT to Hereford last summer gave me an opportunity of repeating Haas' experiment on the tolerance of hard water by *margaritifera*, which lives abundantly in the River Wye there, while in the bank of the river valley are a number of hard water springs which give the

necessary supply of natural hard water. The mussels were collected between 15th and 19th July and the experiments made in small basins and dishes. On the 23rd the experiment had to be moved to Radlett and various hard waters in Herefordshire were tried.

WATER	Mg. of Ca. per litre	No. of Mussels used	Duration of trial days	RESULT
River Wye at Hereford ...	15*—29	4	38	Water foul: 2 dead, 2 sick
Butts Spring, Hereford ...	116*—135	3	8	Alive and well
White House Spring, Hereford	119*—136	3	8	do.
Radlett Tap Water ...	49—59*	4	38	do.
„ under Dripping Tap...		3	108	do.
London Tap Water ...	96—124*	4	29	do.
Small Stream at Radlett ...	59	2	100	One well, one sick
River Colne at Aldenham ...	102—112	9	81	Three well
Distilled Water ...	0	2	15	Alive and well

The figures for the calcium, for some of which I am indebted to Mr. Randall, are partly from analyses made of the actual waters used in the present experiment and partly from determinations made in 1916-1917 (marked *); divided by four they give approximately the hardness on the ordinary scale of notation. The reactions, in equilibrium with air, were:—Wye 7.4, Radlett tap 8.2, London tap 7.9. The trial of Radlett water under a dripping tap was made to meet the objection, obviously valid in such experiments, that the mussels might alter their environment in small volumes of water.

These results show clearly that hard water is by no means necessarily quickly fatal to *margaritifera*: of 18 put into very hard water 16, and of 9 in moderately hard water 8, were alive and well when the several trials were terminated. They do not, however, in any way alter the fact that, as far as we know, the species is in nature confined to soft water streams. It may well be that conditions which the adults will tolerate for a few weeks are unsuitable for their whole lives especially, perhaps, for the young stages. Though common in the Wye it does not occur in the tributary Lugg, which has given calcium figures of 46, 53 and 58 at different times and places.



MOLLUSCA IN THE NEIGHBOURHOOD OF MARKET HARBOROUGH.

By A. E. ELLIS.

(Read before the Society, February 6th, 1924).

(Concluded from p. 192).

This quarry is divided by a wire fence into two portions, to one of which sheep and cattle have access; *Theba*, *H. virgata*, and most of the *H. itala* are confined to the other (protected) portion. *Theba* occurs chiefly on *Tussilago*. *Cepæa nemoralis* v. *rubella* 00000 and 12345 occur in this quarry. I found 30 shells of *Agriolimax agrestis* in a spider's web under a stone in this quarry.

In a more recent quarry, a mile from that just dealt with, occur (October, 1923): *Agriolimax agrestis*, *Polita cellaria*, *Hygromia hispida*, *H. striolata* (and v. *alba*, in equal numbers), *Cepæa hortensis* v. *lutea* 00000, 12345 and 10345, *Polita nitidula*, *Arianta arbustorum*, *Arion hortensis*, *Helicella caperata* (and vars. *ornata* and *fulva*), and *Cæcilioides acicula*. *H. caperata* is abundant on dead leaves of *Tussilago farfara*, and is frequently to be found in winter hibernating in shells of *Cepæa*, washed down from a Holocene deposit in the quarry, exposed in two places some 20 yards apart, of which it may be interesting to give details. The locality is on the south-west side of the Desborough to Rothwell Road, about half-a-mile from Rothwell, at an altitude of 400 feet, and 100 feet above the river Ise, which flows 660 yards away; the only other stream in the vicinity is the Slade, over a mile off. The fossils are found from 6 inches to 2 feet below the surface; in December, 1923, I found the following species (immature stages of many of the species were also present):

<i>Carychium minimum</i>	<i>Cochlicopa lubrica</i>
<i>Pupilla muscorum</i>	<i>Limnæa pereger</i> (forms character-
<i>Vallonia excentrica</i>	istic of streams)
<i>Cæcilioides acicula</i>	<i>L. truncatula</i>
<i>Acanthinula aculeata</i>	<i>Vitrea crystallina</i>
<i>Pisidium</i> sp.	<i>Pyramidula rotundata</i> (abun-
<i>Arion</i> sp.	dant)
<i>Agriolimax agrestis</i>	<i>Helicella itala</i>
<i>Polita cellaria</i> (fairly numerous)	<i>Hygromia hispida</i> (abundant)
<i>P. nitidula</i> (abundant)	<i>Helicigona lapicida</i> (frequent)
<i>P. pura</i>	<i>Ena obscura</i>
<i>P. radiatula</i>	<i>Clausilia bidentata</i>
<i>Arianta arbustorum</i> (and v. <i>fuscescens</i>)	<i>Punctum pygmæum</i>

Cepæa nemoralis 12345 (43, 15 at least being *libellula*); 00000 (6 specimens); 023(45)—1 specimen; *libellula* 1(23)(45),—1; *libellula* (12)3(45),—2; 1(23)45,—2; 123(45),—3; 00300 (6 specimens, 2 *libellula* and 4 *rubella*); :2345 (1 specimen, *undulata*); :2345,—1; :2345,—1; (123)(45),—3; (12)345,—2; 02345 (5, 2 being *libellula*); ::45,—1; ::345,—1 specimen.

Cepæa hortensis 00000 (55 specimens), 12345 (56 specimens), 10345 (21 specimens), 2 *arenicola* 12345, 1 *arenicola* 10345; 1 02345, and 2 00345. All except the *arenicola* (3 shells) are apparently *lutea*.

On an old ivy-clad wall at Kelmarsh, Northants., which is thickly covered with humus, I found in April, 1923:

<i>Agriolimax agrestis</i>	<i>Vitrina pellucida</i> (abundant, of small size)
<i>Punctum pygmæum</i> in great profusion	<i>Limax maximus</i>
<i>Pyramidula rotundata</i>	<i>Arion circumscriptus</i>
<i>Polita nitidula</i>	<i>Lauria cylindracea</i> (abundant)
<i>Cepæa nemoralis</i> v. <i>libellula</i> (12)345	<i>Vitrea crystallina</i>
<i>Vallonia costata</i> (very numerous)	<i>Hygromia hispida</i>
<i>Cochlicopa lubrica</i>	<i>Carychium minimum</i>
	<i>Arion ater</i>

As examples of the mollusca of open fields may be taken the following:

On the top of a hill between Thorpe Langton and Stonton Wyville, Leics., amongst nettles and grass in the centre of a pasturage field were (April, 1903): *Vitrina pellucida*, *Agriolimax agrestis*, *Arion intermedius*, *Polita cellaria*, *P. alliaria*, *P. nitidula*, *Hygromia hispida*, and *Vallonia excentrica*. A rather more usual field is one on the outskirts of Harborough, which yielded in April, 1922: *Arion intermedius*, *A. ater* v. *aterrima*, and *Agriolimax agrestis*. *Polita alliaria* is also found in grazing fields, by the side of ponds, etc., and I have found *Clausilia bidentata* under a log in a grazing field at Little Bowden.

Waste places have a distinct fauna, as for instance the disused brickfields at Little Bowden, Leics., where I found in April, 1922, amongst nettles, grass, and other weeds, and under rubbish:

<i>Agriolimax agrestis</i>	<i>H. caperata</i>
<i>Polita cellaria</i>	<i>Vitrina pellucida</i>
<i>Arion ater</i> vars. <i>atra</i> and <i>marginella</i>	<i>Polita nitidula</i>
<i>Arion hortensis</i>	<i>Arion circumscriptus</i>
<i>Pyramidula rotundata</i>	<i>Hygromia striolata</i>
<i>Helicella virgata</i> and v. <i>lutescens</i>	<i>Helix aspersa</i>

Cepæa nemoralis v. *libellula* 12345, :2345, ::345, *interrupta* ::345 and 1(23)45.

In an old quarry where refuse is deposited at Middleton, Northants. partly shaded by trees, the following species were observed in March, 1923 :

<i>Hygromia striolata</i> (also vars. <i>alba</i> , <i>depressa</i> and a pale <i>rubens</i>)	<i>Clausilia bidentata</i>
<i>H. hispida</i> (and vars. <i>albocincta</i> and <i>fusca</i> , the latter in equal numbers with the type form)	<i>Ena obscura</i>
<i>Polita cellaria</i>	<i>Limax maximus</i>
<i>Vitrina pellucida</i>	<i>Polita nitidula</i>
<i>Arion hortensis</i>	<i>Arion circumscriptus</i>
<i>A. intermedius</i>	<i>A. ater</i>
	<i>Agriolimax agrestis</i>
	<i>Polita alliaria</i>
	<i>Pyramidula rotundata</i>
<i>Cepæa hortensis</i> v. <i>lutea</i> 12345, 00000, 10345, 123(45), v. <i>roseolabiata</i> 00000, and v. <i>arenicola</i> 12345	
<i>C. nemoralis</i> v. <i>libellula</i> 00300, (12)3(45), and v. <i>hyalozonata</i> 12345.	

A typical garden association is that of a garden on the Northampton Road at Market Harborough, April, 1922 :

Agriolimax agrestis (*reticulata* and *pallida*)

Arion hortensis (these two in obtrusive abundance)

Milax sowerbyi (this slug passes the day under ground or beneath stones and rubbish, and like the two species of *Limax* next mentioned, issues forth in great force on warm, damp evenings after dark).

Limax maximus (lives also in cellars and outhouses ; the "domestic" form is v. *obscura*, but commences as *sylvatica*, the darker colouring becoming diffused only in the mature individual ; in fields and woods the *sylvatica* type of marking is usually retained by the adult).

Limax flavus (occurs also in cellars ; it is abundant in this garden, spending the day in holes in the wall, or rarely under refuse heaps, and coming out at night to feed on such kitchen garbage as potato-peelings, banana rinds, and scraps of meat ; it is particularly partial to cooked runner beans, but ignores all uncooked green vegetables ; its congener in the garden has similar habits and tastes).

Arion circumscriptus (the garden specimens are indistinctly banded and of large size ; I have one of a reddish hue ; woodland and "wild" individuals generally on the other hand are prettily and clearly marked, the form known as v. *leucophæa*).

Polita cellaria (in an outhouse).

Hygromia striolata (and vars. *alba* and *depressa*).

Helix aspersa (and vars. *flammea* and *fasciata*).

Mention may also be made of the following, which occur in localities besides those dealt with above.

Limax maximus is frequent in woods, plantations and gardens, but is never present in great numbers like its congener *L. flavus*, which is sometimes very numerous in gardens at Market Harborough. The largest specimen I have is from a hedge-bank near Thorpe Langton, and measured five inches in length when alive. The shells of garden specimens from Market Harborough are well formed but not strongly calcified, while shells of specimens I obtained on the Northampton Sand at Middleton had much heavier shells in proportion to their size.

L. arborum: Tawntry Plantation (April, 1923), on wet ground by a streamlet, under dead branches of elder, in company with *Agriolimax agrestis*, *A. lævis*, *Limax maximus*, *Polita nitidula*, *P. cellaria*, *P. rogersi*, *Arion ater*, *A. intermedius*, *A. hortensis*, *Cepæa nemoralis* (vars. *libellula* 00::0, *rubella* 12345—these two in equal numbers, and one *rubella* 00::0); Arthingworth, in a small oak, pine and ash plantation (ground flora *Scilla nutans*, *Primula veris*, and *Sanicula*), in company with *Agriolimax agrestis*, *Arion ater*, *A. subfuscus*, *A. intermedius*, *A. circumscriptus*, *Polita alliaria*, *P. nitidula*, *Vitrea pellucida*, *Hygromia hispida*. The local specimens of this slug are var. *nemorosa*.

Agriolimax agrestis is a ubiquitous and abundant species, occurring in every sort of terrestrial habitat, and in association with nearly all kinds of land mollusks. It is hard to say what its optimum environment is, but it is perhaps most numerous in gardens, partly owing to the comparative freedom from competition, as well as on account of the abundance of palatable food; the largest individuals occur in the quarries at Desborough, amongst coarse grass and other xerophytic plants.

A. lævis: Sutton Bassett, Northants., on the banks of a small stream, amongst *Scrophularia aquatica*, *Rumex*, and grasses, in company with *Agriolimax agrestis*, *Arion ater*, *A. intermedius*, *Succinea elegans*, *Limnæa truncatula*, *Cepæa nemoralis* (vars. *rubella* 12345, *rubella-fascialba* 00300—the most numerous form, *libellula* (123)(45), and *libellula-fascialba* 00300), April, 1923.

Vitrea crystallina is a common species amongst moss and decaying leaves in woods and moist places.

Polita rogersi from a small plantation near Oxenden, Northants., where it occurs sparingly in company with an abundance of *P. nitidula* and *Hygromia hispida* (var. *albocincta*, and equal numbers of var. *fusca* and the type) and lesser numbers of *Vitrea crystallina* and *Arion circumscriptus* var. *leucophæa*, has a rather dull appearance of shell, almost like *P. nitidula*.

Arion ater never attains a great size in woods, although it varies considerably in such habitats; the largest specimens are found in open fields and meadows, where the animal is uniformly black. It may be seen in swarms after—and frequently somewhat before—rain, for the black slug is a fairly reliable weather-prophet, within limits.

Arion intermedius var. **plumbea** is the normal form of this slug in moist and shady woods, the yellowish form being found in fields, clearings in woods, and open places generally, although it also occurs in woods. The finest specimens are from a pasture at Little Bowden. At Sibbertoft, in a wood where *plumbea* is the usual form, it is replaced by the type in a portion that has been coppiced (April, 1923).

Arion circumscriptus occurs in similar situations to the last, but rather replaces it in woods, and is not so prevalent in cultivated places.

Helicella virgata: both the normal form and var. *lutescens* occur in approximately equal numbers at Market Harborough on the railway embankment (Rugby line) and on the roadside (Kettering road), at Little Bowden on the disused brickfields, and at Desborough in an Oolite quarry north of the railway line. The Market Harborough specimens have rather thin shells delicately tinged with purple, and are very distinct in appearance from those on the Oolite. There are at least five distinct colonies in the neighbourhood, differing from one another in shell characters and size, although the colonies can not have been isolated for very long, and are still for the most part in apparently potential communication with one another—that is to say the territory occupied by one colony is connected with that of another by a railway embankment or road along the sides of which *virgata* could quite well travel; perhaps local variations in the water content of the soil, the deposition of sand or cinders, or the activities of road-menders are effectual barriers to the spread of this eminently calciphilous species, and prevent these seemingly inhabitable intervening areas from being colonised by the snail. Var. *conica*: Market Harborough; var. *depressa*: Desborough.

H. itala: the form *trivialis* is the prevalent form, except at Sutton, and occurs at Sutton Bassett (scarce), Kibworth, Desborough and on the railway embankment at Market Harborough (London Line). Var. *lutescens* is found with *trivialis* at Market Harborough, Kibworth, and Sutton Bassett; var. *charpentieri* occurs at Desborough and at Market Harborough; var. *alba* Moq. is the prevalent form on the side of the road just north of Sutton Bassett; var. *grisescens* and var. *monozona* are found at Kibworth, on an embankment where the railway is crossed by the Wistow road. Monstr. *disjunctum* occurs at Market Harborough and Desborough, and *subscalare* at Market Harborough. The form *trivialis* also inhabits an old quarry near Nevill Holt.

H. caperata: the type occurs on the railway embankment at Market Harborough, where there is a large colony extending along the London line; about $1\frac{1}{2}$ miles from the station, var. *fulva* is present over a limited area in equal numbers with the type, and var. *ornata* occurs sparingly throughout most—but not the whole—of the colony. This colony is much subject to vicissitudes, as the herbage along the embankment is burnt from time to time during the summer; the devastated areas are rapidly re-colonised however from patches that have escaped, and so the colony continues to thrive. I have noticed these snails on wet evenings in September congregated in great numbers on dead plants of *Achillea millefolium*, but they never seem attracted to the plant when alive and green. In one of the quarries at Desborough the type form of this snail is plentiful, in a neighbouring quarry it occurs with approximately equal numbers of vars. *fulva* and *ornata*; in the former quarry numerous other species occur, including two other species of *Helicella*, as above enumerated, while in the latter only about half-a-dozen other species are found, and no other *Helicellæ*. Whether the absence of the competition of other species is favourable to the production and survival of varietal forms in *H. caperata* is difficult to determine, but it is certainly the case that where this snail has undisputed possession of the territory it shows greater richness in variety and numbers; it may be that the former merely follows from the latter—large numbers in a confined area increasing the chances of the occurrence of mutations. At Medbourne, Leics., where the Drayton road crosses the railway, the type form occurs in company with *H. heripensis*, over which it has a superiority in numbers; both species cluster during dry weather in clumps of grass and *Achillea millefolium* (*H. heripensis* is the easier to find on dry days, being apparently less sensitive to drought than its congener), and emerge before and during showers to crawl over the bare ground and browse presumably on algæ and decaying vegetable matter. All these colonies are more or less in continuity with one another by way of railways; prior to the laying down of the lines, the species was probably absent from large areas. An unusually large form occurs in considerable numbers by the roadsides near Middleton.

Hygromia hispida: the local form of this species is rather small and very narrowly umbilicate, suggestive of Westerlund's *liberta*. Specimens from damp and shady places are more permanently hispid and larger than those living in arid and exposed situations, as for instance on the railway embankments. Var. *albocincta* is frequent.

Helix aspersa: var. *lutescens* occurs at Medbourne. I found one dead shell of var. *major* in the canal at Foxton, 1922.

Cepæa nemoralis : on the sides of the railway line (Northampton line) there is a large colony, comprising the following variations (July 1922) :

Var. *libellula* 12345, (123)(45), (12)3(45), 123(45), 10345, 00345, 0034 :, 023(45), :23(45), 1(23)(45), 0:34 :, 00:::

Var. *libellula-undulata* 00345, :2345, 02345, 12345.

Var. *rubella* 00000, 12345, (123)(45), ::345, 1:345, 10345, 00345, 00340, 0:::0, 00:::0, 023(45), 02345, 103(45).

Var. *rubella-undulata* 12345.

At Foxton occurred var. *castanea* 00000 and other forms (1921).

C. hortensis var. *lutea* 00000 occurs at Dingley.

Succinea elegans is often seen in company with *Limnæa truncatula*, as for instance by the reservoir at Welford. The size of this species varies greatly ; on the banks of small streams, as at Great Bowden, the animals are of small size (maximum shell height 8.5 mm.), by the river Welland they are of medium size (9.5 mm.), and attain the largest dimensions by the edges of reservoirs, at Welford for example (13 mm.).

Ancylus fluviatilis occurs in the R. Ise, and Welford Reservoir ; in the latter locality the shells attain a length (across the aperture) of 8.5 mm.

Acroloxus lacustris : rejectamenta of R. Ise in 1922.

Limnæa auricularia : Welford reservoir, Sept., 1923.

L. pereger is as ubiquitous in the water as *Agriolimax agrestis* is on land. The size appears to be more or less correlated with the volume of the water in which the animals live, but is probably only indirectly so ; I think that the available oxygen is the main factor in determining the size of these animals ; small ponds, on account of the decaying matter they contain, and swift streams, by reason of their low temperature, contain less oxygen in solution than large bodies of water, such as reservoirs and rivers and canals, so that cutaneous respiration must be largely restricted in such badly aerated waters ; the variety *ovata* is the usual form in the canal, and may attain a fair size. This creature is less incommoded by the draining or drying up of the water than other aquatic mollusks, and I have seen it crawling about on wet mud under such circumstances in large numbers. This snail is subject to much local variation according to the environment : for instance, at Saddington reservoir the form of this mollusc is of medium size (about 15 mm.) and rather thin shelled, but in a ditch draining into the reservoir, liable to dry up in summer, the *pereger* are small (about 8 mm.) and have quite substantial shells. Periodic variation also occurs (see *Journal*, xiii, p. 48).

L. truncatula is common on the banks of streams and reservoirs.

L. stagnalis occurs in all the reservoirs and in a pond at Wistow, Leics.

Planorbis corneus: Wistow, 1922.

P. albus in Welford reservoir attains a breadth of 7.5 mm.

P. crista, of small size, occurs on *Potamogeton lucens* in Welford reservoir, Sept., 1923; and in the canal at Market Harboro'.

P. umbilicatus: a pond on Clack Hill and Welford reservoir.

Hippeutis fontanus: Saddington reservoir, Sept., 1923.

Physa fontinalis: Welford reservoir, Dec., 1923.

Aplecta hypnorum: Saddington reservoir, Sept. 1923.

Bithynia tentaculata in the Ise attains a height of shell of 15 mm. The species is very abundant on *Fontinalis* in a pond at Wistow and in Saddington reservoir; in the last locality some var. *producta* occur (Sept., 1923).

Valvata piscinalis: R. Ise, 1922.

Unio pictorum: in Welford reservoir both the *Unios* and *Anodonta cygnea* are abundant and attain a good size, and are of exceptionally fine colour and free from erosion. The abundance of plankton and the comparative freedom of the water from silt in the reservoir may be factors especially favourable to these Lamellibranchs. This species attains a length of 110 mm. and a height of 42 mm. here.

U. tumidus attains a size of 121 × 50 mm. in Welford reservoir.

Anodonta cygnea: pond at Marston Trussel and Welford reservoir; in the latter place the shells are mostly of a bright green, and attain a length of 143.5 mm. and a height of 74.5 mm.

Sphærium lacustre in Saddington reservoir reaches a length of 12 mm. The species also occurs in Welford reservoir.

Pisidium amnicum: Welford reservoir, Dec., 1922.

I have recorded in all 85 species of Mollusca living in the neighbourhood of Market Harborough, and one (*H. lapicida*) which I have only found in a fossil condition. Other observers have also published notes on species from this district from time to time in the *Journal*, but a list of such references would serve no useful purpose.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

531st (Annual) Meeting, held at the Manchester Museum, October 25th, 1924.

The President, Mr. J. Wilfrid Jackson, M.Sc., F.G.S., in the chair.

The following were present :—Messrs. G. C. Spence, F. Taylor, B. Bryan, W. E. Alkins, E. R. Brown, A. K. Lawson, A. T. Hopwood, W. H. Heathcote, Greevz Fysher, H. Crowther, Giles Owen, L. B. Jump, C. H. Moore, R. Harrison, C. Oldham, R. J. Welch, R. C. Moore, Rev. C. E. Y. Kendall, Drs. G. H. Carpenter and A. E. Boycott and Miss M. C. Moore.

Appointment of Scrutineers.

Messrs. A. K. Lawson and W. H. Heathcote were elected Scrutineers.

Appointment of Auditors.

Messrs. C. H. Moore and Giles Owen were elected Auditors.

New Members Elected.

C. J. Mogridge. V. A. G. Brown. A. Blok. The Hon. Lionel Lindsay.

Resignation.

A. J. Saban.

Member Deceased.

J. H. A. Jenner.

Election of Honorary Member.

On the nomination of the Council, and on the motion of Dr. A. E. Boycott, seconded by Henry Coates, and supported by C. Oldham and others, Robert Standen, M.Sc., was unanimously elected an Honorary Member of the Society in place of Lt.-Col. H. H. Godwin-Austen, deceased.

Presidential Address.

The President delivered an Address on “The Distribution of *Margaritana margaritifera* (L.) in the British Isles.”

A cordial vote of thanks was passed to the retiring President for his interesting address and his services to the Society.

A vote of thanks was also accorded to the authorities of the Manchester Museum for the use of rooms for meetings of the Society.

Election of Officers and Council.

The Scrutineers reported that the Officers and Council for 1924-25 as nominated by the Council had been unanimously elected (*see page 193*).

Exhibits.

By the President :—Specimens of the Pearl-mussel from numerous localities ; also map showing British distribution.

By Mr. J. Davy Dean :—Dextral species of *Clausiliidae* from three of the sections or genera, *Alopi*a (with *Ithyption*), *Albinaria* and *Formosana*.

By Mr. G. C. Spence :—Series of *Achatina*, etc.

By Mr. C. H. Moore :—Shells from Madeira.

By Mr. R. J. Welch :—Living specimens of *H. itala* showing local variations, from the Rosapenna highly calcareous dunes, Sheephaven, West Donegal.

By Mr. R. Harrison :—Unios and Anodons from many localities.

By the Rev. C. E. Y. Kendall :—*Helicidae* from U.S.A.

By Mr. E. Crapper :—Series of shells and pearls of the Pearl-mussel, from river Tay, Perth, with photos of the habitat and method of collecting.

By Mr. A. K. Lawson :—Shells from the Roman site, East Cliff, Folkestone ; section of map of survey of Non-Marine Mollusca of Altrincham district, with some typical examples.

By Dr. A. E. Boycott :—Living *Vitrea cellaria*, *Hygromia striolata*, *Theba cantiana* and *Zonitoides nitidus*, from Quebec, Canada ; *Paludestrina jenkinsi* v. *aculeata*, from Criccieth, Wales.

By Mr. W. H. Heathcote :—*Vitrea lucida*, from Grange-over-Sands, Lancs. ; *Phytia myosotis*, from Longton Marsh, near Preston.

By Mr. B. Bryan :—*Arion ater*, taken from the stomach of a Brown Owl at Longton, Staffs. ; also species from Tenby, etc.

By Mr. C. Oldham :—*Euparypha pisana* v. *alba* from Rush, Co. Dublin ; *Cochlicella barbara* and *Xerophila virgata*, showing variation in colour, from Rush, Co. Dublin ; also living *Planorbis corneus* (aquarium bred). In the latter, all the animals have bodies devoid of pigment, but because of the large amount of hæmoglobin in the blood in *Planorbis*, they are crimson instead of hyaline as is usual in albino mollusca. Of the two full-grown specimens, one has a normally coloured (brown) shell, the other a pure white (albino) shell, but the albinism is obscured by the redness of the contained animal. The young specimens—the offspring of the two full-grown ones—have normally coloured (brown) shells, and albino (red) bodies.

By Mr. E. R. Brown :—*Cypræa pyriformis*, *reticulata*, and *erosa* v. *nebrites*, *Oliva irisans* (fine colour var.), *Ancillaria cingulata* and *elongata*.

By the Manchester Museum :—Selection from the fine *Conus* collection recently presented by Mr. A. T. Hopwood.

ANNUAL REPORT.

THIS is the Forty-Eighth Annual Report of the Society. The membership at the last annual meeting stood at 279. Since that time we have lost eight members by resignation, four by death, and three have been struck off the roll in accordance with Rule iv, making a total loss of 15. On the other hand, ten new members have been added to the roll, the membership now being 274.

The losses caused by death are those of Lieut.-Col. H. H. Godwin-Austen, a Past President and Honorary Member of the Society (Obituary in this Journal, July, 1924, p. 141) ; Silas C. Wheat ; A. D. R. Bacchus ; and J. H. A. Jenner.

The usual monthly meetings have been held at the Manchester Museum, and the attendance at these has been fairly good. In addition to many general exhibits, the following special exhibits have been held :—*Solarium*, *Cataulus*, *Paludestrina jenkinsi*, and British Land Operculates.

Thirty-two papers and notes have been read, and some of these have already appeared in the pages of the Journal.

Since the last annual meeting three numbers of the Journal have been published, viz., vol. 17, No. 3, December, 1923 ; No. 4, March, 1924 ; and No. 5, July, 1924 ; comprising 96 pages and 21 text-figures.

The McClelland Index, mentioned in the last annual report, has been somewhat delayed, but is now approaching completion, and its publication is expected shortly.

It is pleasant to record that the Victoria University of Manchester has acknowledged the life-work of one of our oldest members, Mr. Robert Standen, by conferring upon him the degree of Master of Science. The Council takes the opportunity of congratulating Mr. Standen upon this recognition. In like manner the Council wishes to congratulate Mr. A. S. Kennard, the President of the London Branch, upon his election as an Associate of the Linnean Society.

As already noted in the pages of the Journal (p. 154), February of this year saw the completion of the fiftieth anniversary of our Journal, Vol. 1, No. 1. having been published in February, 1874, under the editorship of our esteemed Honorary Member and one of the Founders of the Society, Mr. J. W. Taylor, M.Sc. Mr. Taylor has contributed many articles to the Journal during its career, beginning with an introduction to No. 1, in 1874, and completing the fifty years with an article in our issue of July 1924—a remarkable record.

The Library has received several additions during the year, the donors being Drs. W. H. Dall and H. A. Pilsbry, Messrs. W. E. Alkins, G. C. Robson, Bryant Walker, James A. Grieg, H. C. Burnup, A. S. Kennard, B. B. Woodward, H. Watson, C. Hedley, W. B. Marshall, H. B. Baker, H. Schlesch, G. C. Spence and Miss A. L. Massy. The Trustees of the British Museum (Natural History) and the Committee of the Manchester Museum have also presented their publications.

Dr. A. E. Boycott and Capt. Cyril Diver have also deposited in the Library the maps showing the location of the two ponds containing sinistral *Limnæa pereger* at King Lane, Leeds, and at Hesleden, Co. Durham.

Mr. J. W. Taylor has very kindly presented to the Society an enlarged copy of the portrait of J. Gwyn Jeffreys.

The donations to the Cabinet consist of a specimen of *Neritina fluviatilis* from Cardiff (coll. G. A. Martin, May, 1924)—the first record for Wales—presented by Mr. J. Davy Dean; also *Helix aspersa* from Gourdon, Kincardineshire, collected and presented by Mr. E. Crapper.

RECORDER'S REPORT (Non-Marine Mollusca).

SINCE the last Report (vol. xvii. p. 122) the following new records, 33 in number, have been added to the census :—

Cornwall W. (1) :—*Helicella caperata caperata* (H. Coates).

Hants. N. (12) :—*Succinea elegans*, *Physa fontinalis*, *Planorbis contortus*, *Ancylus lacustris*, *Pisidium nitidum*, *P. subtruncatum* (A. E. Boycott).

Surrey (17) :—*Hyalinia lucida* (doubtfully wild : E. W. Bowell).

Oxford (23) :—*Pisidium milium*, *P. obtusale* (J. E. Cooper).

Bucks. (24) :—*Arion circumscriptus* (C. Oldham), *Hyalinia lucida* (Loudwater, apparently wild : O. W. Richards).

Norfolk W. (28) :—*Helicella heripensis* (A. E. Ellis).

Bedford (30) :—*Helicella caperata caperata* (A. E. Ellis).

Monmouth (35) :—*Limax flavus* (A. E. Boycott).

Glamorgan (41) :—*Vertigo angustior* (shell drift in Oxwich sand dunes : H. E. Quick), *Neritina fluviatilis* (G. A. Martin and J. D. Dean).

Carmarthen (44) :—*Limax cinereoniger* (C. Oldham).

Cardigan (46) :—*Cochlicella barbara*, *Vertigo antivertigo* (C. Oldham).

Anglesea (52) :—*Amalia sowerbyi* (C. Oldham).

Lincoln S. (53) :—*Paludestrina ventrosa*, *P. jenkinsi*, *P. stagnalis*, *Phytia myosotis* (J. F. Musham).

Lancashire S. (59):—*Vertigo pusilla* (Hall Road sand hills, alive: L. W. Grensted).

Yorkshire S. E. (61):—*Pseudanodonta rothomagensis* (Everingham: G. Fysher).

Durham (66):—*Theba cantiana* (Killingworth, wild in hedgerows: C. Robson), *Paludestrina ventrosa* (Greatham Marshes), *P. jenkinsi* (T. R. Goddard).

Northumberland S. (67):—*Limax cinereoniger* (T. R. Goddard), *Planorbis corneus* (J. W. H. Harrison).

Dumfries (72):—*Balea perversa* (D. B. Macaulay).

A. E. BOYCOTT.

RECORDER'S REPORT (Marine Mollusca).

I have the honour to report to the President and Council of the Conchological Society that I have drawn up preliminary lists of species and varieties of Marine Mollusca known to occur from high water mark to 100 fathoms, and that I have entered some five thousand records. It is hoped to inaugurate a scheme (on my return from India in the spring of 1925) inviting co-operation of all members of the Society in accumulating detailed records of each group of mollusca through the medium of the Journal.

RONALD WINCKWORTH.

REPORT OF THE LONDON BRANCH.

TEN Meetings were held and were well attended. The exhibits arranged for (as published in the year's Syllabus) were attractive, and the Notes on them by the President, A. S. Kennard, by Lt.-Col. A. J. Peile, and by others were very interesting and instructive. New members have lately been enrolled so that the future of the London Branch promises well. Two Field Meetings were held, but our members are too scattered over London for the attendance at such to be other than local.

J. C. DACIE, *Hon. Sec.*

REPORT OF THE NORTH STAFFORDSHIRE BRANCH.

FURTHER research work has been done in this district, especially by Messrs. J. and W. Hill, of Leek, and Mr. W. E. Alkins of Oakamoor. *V. pygmæa* has again turned up, this time in the Manifold Valley. In the same district an interesting var. of *H. nemoralis* with a single whitish band (00300) has been found, also *H. hortensis* (12045) and *H. arbustorum* without the usual fleckings and bandless. *Acanthinula aculeata* is common and widely distributed in the Churnet Valley. The wet summer at first seemed to suit the Helices, but they disappeared later on.

B. BRYAN, *Hon. Sec.*

Vertigo angustior in Glamorgan.—On August 11th, 1924, while examining material from shell drift on the blown sands of Oxwich dunes in Gower, I found a single specimen of *Vertigo angustior*. The specimen is not quite perfect but looks fairly recent. Whether it is holocene or recent, the record is interesting as the locality is a long way from any mentioned in the Roebuck Memorial census. Jeffreys in *B.C.* mentions Singleton, near Swansea, as a locality. Oxwich dunes are about nine miles from Singleton. The same gathering contained *V. pygmæa*, *P. muscorum*, *Punctum pygmæum* and the common dune shells, with *Phytia myosotis*, small *Rissoas*, &c. On August 28th, I found *V. pygmæa*, *V. antivertigo* and *P. pygmæum* living in the same locality, so *angustior* may yet be found living there.—H. E. QUICK (*Read before the Society*, Sept. 6th, 1924).

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JOURNAL OF CONCHOLOGY.

VOL. 17.

JULY, 1925.

No. 8

OBITUARY NOTICE: ROBERT STANDEN.

By J. WILFRID JACKSON, M.Sc., F.G.S.

(Read before the Society, April 4th, 1925).

THE death of Robert Standen on March 15th, 1925, after a protracted illness, attended with much suffering, has removed from Manchester and neighbourhood a naturalist of broad outlook, striking personality, and constant, unassuming helpfulness. His passing creates a serious gap in the ranks of this Society and has deprived us of one whose kindly presence at the meetings has long endeared him to all with whom he has come into contact.

Mr. Standen was born at Goosnargh, near Preston, on January 14th, 1854. He lost his father, who was keenly interested in natural history and from whom he doubtless inherited his proclivities, at a very early age, and was adopted by his grandfather, Robert Sharples, one of the principal farmers of the district. He began to make collections of all sorts of natural history objects at an early age and received every encouragement in his hobbies from his grandmother, who bought him books and a microscope. He attended the Goosnargh Grammar School until the age of 17, afterwards, for some years, continuing his studies under the able tuition of the Vicar of the parish, the Rev. William Shillito, M.A.; meanwhile taking an active part in the work of the farm.

The district around Goosnargh was an ideal hunting ground for a youth of young Standen's inclinations, and he gradually extended his researches further and further afield, visiting the quarries of Longridge, Chipping and Clitheroe, in quest of fossils, exploring the Fells, the numerous woods and streams, and all along the seaboard of the county for birds, insects and plants, and in this way became acquainted with the haunts of many rarities. He was probably the only naturalist in Lancashire who knew of a really wild habitat for *Tulipa sylvestris*, of which he discovered a large patch—unfortunately eradicated about 35 years ago by the felling of the old timber among which it grew and the thick replanting of the ground with larch and other trees—and supplied specimens to the herbaria of several friends.

He also discovered in these early years the Bird's Nest Orchis, the Snow-flake, and many other rarities.

While resident at Goosnargh, Standen made considerable collections of Lancashire flowering plants and ferns, Lepidoptera, Coleoptera and fossils. He became acquainted with the leading naturalists of Preston and district, including the Rev. Jonathan Shortt, of Leyland, the Rev. Edward Banister, A. Dimmock, Charles Ashfield, and J. B. Hodgkinson, from whom he received valuable assistance in his geological, ornithological, botanical and entomological studies. In these early days he had a large circle of correspondents in various parts of the country, and contributed many notes and articles to the Manchester City News and various periodicals on a variety of subjects. He was deeply interested in the local names and folklore of plants, insects and animals, and wrote several articles upon the subject in Science Gossip and elsewhere.

His long rambles in search of specimens carried him into many remote nooks of the county little-known to naturalists, particularly along the courses of the Ribble, Lune, Wyre and Brock, and the wild moorlands and cloughs of North and East Lancashire, lying along the Yorkshire borders. He penetrated far into the latter county on various occasions and collected in many parts of it. The hills and cloughs bordering the whole length of the Rossendale Valley were familiar to him and so were some of the Derbyshire, Cumberland and Westmorland dales. One of his favourite hunting grounds was the wild Fell country lying between Fairsnape, Parlick Pike, the Trough of Bowland and the Bleasdale Forest, where he wandered for days together, sleeping out on the hills, and returning home laden with eggs, insects, plants and fossils. In these excursions he met with many adventures, and had numerous interesting and curious experiences, with the recital of which he entertained his friends on many occasions in later years.

In his younger days he was expert with gun and rod, and his angling pursuits afforded many exceptional opportunities of studying wild life to perfection, and he acquired much expertness in woodcraft, and the ways of small animals, etc. He wrote a paper in "The Field Naturalist and Scientific Student" on the smaller mammalia of the Goosnargh district, full of interesting observations, giving, amongst other things, circumstantial accounts of rat migrations he had witnessed, and the methods by which these animals carry off hens' eggs as observed by him.

In 1884 Standen married the eldest daughter of Mr. William Mayor, headmaster of the National School at Newchurch-in-Rossendale, and in the same year he obtained an appointment as Farm

Bailiff and Industrial Trainer at the Swinton Industrial School, near Manchester. During his residence there he interested himself in the formation of a school Museum for teaching purposes, and got together an interesting series of local objects of natural history and Carboniferous fossils from the local coal-pits and quarries. He also joined the Lancashire and Cheshire Antiquarian Society about this time, and took great interest in their meetings and excursions. A year later he seriously took up the study of Conchology, and made many excursions either alone or in company with his old friend W. H. Heathcote, of Preston, into many parts of the county in search of shells. Having obtained a good working knowledge of the mollusca, Standen set himself the task of writing a list of the shells of the County Palatine, and his paper on the subject was forwarded to W. Denison Roebuck—the then editor of “The Naturalist,” who had it set up in type. As Standen was not well known to conchologists at that time, Mr. Roebuck sent a proof of the paper to Mr. R. D. Darbishire, of Manchester, and this was the means of bringing Standen into close touch with many local workers. By this contact with fellow “shell-men” the value of the paper was increased by the addition of the observations of R. D. Darbishire himself, Thomas Rogers and others. It was also suggested that the earlier observations of David Dyson and John Hardy should be added, and the final paper was published in “The Naturalist” for 1887. This list, although much knowledge of our molluscan fauna has been gained by subsequent researches, is still the recognised county list. Its publication gave a stimulating impetus to the study of conchology in Manchester, and led to the formation in February, 1888, of a Conchological Club of which Standen became the Secretary. Under the Presidency of Mr. Darbishire this speedily gathered together a number of enthusiastic shell-collectors and had a flourishing career. On the transference of the headquarters of the Conchological Society of Great Britain and Ireland from Leeds to Manchester, the Club, which had for some time been affiliated as a “Branch,” became merged in that Society, and Standen was elected to the post of Hon. Curator.

After five years at Swinton Standen relinquished his post to become the Secretary and Assistant to Professor A. Milnes Marshall in the Zoological Laboratory at Owens College, and was soon occupied with the preparation of the embryological models and sections which were later figured in Marshall’s “Frog” and “Practical Zoology.” On the lamented death of Professor Marshall, by accident among the Lake Mountains, Standen worked for twelve months on the Conchological collections in the Manchester Museum, until a vacancy occurred on the Museum staff, when he was appointed Assistant Keeper in the

Zoological Department, a post he held until the time of his death. During his tenure as Museum officer he visited some of the principal continental Museums for the purpose of studying foreign methods, and the knowledge thus obtained was made good use of in later years. He perfected several excellent cements and preservative methods, which, in his hands, proved remarkably effective, as is amply demonstrated by the skilful restoration of the fine series of "Soul-houses," coffins, pottery and innumerable other articles in stone, wood, bronze and ivory in the extensive collections of Egyptian Antiquities in the Manchester Museum; in the series of burial-urns and associated objects, which he assisted in disinterring from a prehistoric cemetery, near Todmorden, and which may be seen in the Todmorden Free Library; and also in certain Roman pottery in the "Old Manchester" exhibition at the Queen's Park Museum, Manchester.

Standen's zoological work at the Manchester Museum was always carried out with unsurpassed conscientiousness, and the collections with which he had to deal bear ample witness to his accuracy and skill. His main interest was in the study of the mollusca, and during his connexion with the Museum very extensive and valuable collections obtained in various scientific expeditions were submitted to him for identification. From these thousands of specimens have been added to the Museum. In collaboration with Dr. J. Cosmo Melvill elaborate reports were published in numerous scientific Journals, including the *Journal of Conchology*, the Transactions of the Royal Society of Edinburgh, the Annals and Magazine of Natural History, the Proceedings of the Royal Society, and many others. Among the collections dealt with are "The Hadfield Collection" from Lifu, Loyalty Islands; the "Vallentin Collection" from the Falkland Islands; the "Bruce Collection" from the Antarctic; the "Harmsworth-Jackson Collection" from Franz Josef Land; the "Neave Collection" from Rhodesia; the "Townsend Collection" from the Persian Gulf; the "Henderson Collection" from Madras; and the "Haddon Collection" from the Torres Straits, and from all these a great number of species new to science were described and figured. Besides the above he collaborated with Alfred Leicester in a Report on the "Herdman Collection" from Ceylon, and published numerous papers under his own name.

He was a constant attendant at the meetings of this Society, and his vast store of information on the mollusca generally was always freely placed at the disposal of enquirers: he was also a frequent contributor to the pages of the Society's Journal. The geographical distribution of the mollusca and the influence of environment upon species interested him more particularly, and he acquired a considerable knowledge of

the economical and ornamental uses of shells by savage and semi-civilised peoples. On these subjects his opinion was often sought by persons interested in such matters.

On October 16th, 1915, Standen was elected President of the Society, and at the Annual Meeting held on October 25th, 1924, he was unanimously elected an Honorary Member.

During his lifetime he got together very large and complete collections of British Marine and Non-Marine Mollusca, and formed good series of *Cypræa*, *Scala* (*Scalaria*), and several other groups in which he specialised. In his honour the following two species and one variety have been named :—*Scala* (*Constantia*) *standeni* Melvill, 1899; *Cypræa scurra* L. var. *standeni* Melvill, 1905; and *Trophon standeni* Strebel, 1904.

He was for some years a member of the Manchester Microscopical Society and often exhibited at their soirées and meetings. Up to the time of his death he was an Honorary Member of the Manchester Field Naturalists' and Archæologists' Society, and was the Conchological Referee to that Society.

Though primarily interested in the Mollusca during his tenure as Museum officer, Standen became active in recent years in promoting interest in several neglected groups such as the Terrestrial Isopoda and Chelifers, upon which he soon became an authority. The wood-louse *Philoscia muscorum* (Scop.) var. *standeni* Collinge was named in his honour. The inception of the Lancashire and Cheshire Fauna Committee was due largely to his influence and energy.

He spent many vacations in the North, West, and South of Ireland, in company with his wife and daughter, or with a few chosen friends, making large collections of shells and insects—many being additions to the various county faunas. He took part in several dredging expeditions on the North coast of Ireland and in Scotland, publishing reports of the results in the "Irish Naturalist" and elsewhere. By special invitation he, on several occasions, joined the Triennial Conference of the United Irish Field Clubs, and was deputed to furnish reports of the Mollusca met with on these long excursions—which, together with his other papers on the Irish Fauna, have been looked upon by his Irish friends as models of what such reports should be, full of interesting observations, and not merely dry lists.

In 1924, the Manchester University conferred the degree of M.Sc. on Standen in recognition of his services to natural science. This action was not only very gratifying to Standen himself, but also to his numerous friends and acquaintances, and especially so to his family and colleagues on the Museum staff.

One of his last fulfilled labours was the arrangement and exhibition of a selection of the valuable ethnological collection presented to the Manchester Museum by Mr. Charles Heape in 1923.

The death of his wife some twenty-one years ago was a severe blow to Standen. Mrs. Standen was herself keenly interested in botany, a true nature-lover, and an ardent sympathiser with all her husband's scientific pursuits, and during her life-time many delightful holidays were spent in the study of natural history. In his manuscript notes Standen records: "It is not every naturalist who is blessed with a wife who thoroughly appreciates his hobbies." The loss of such an ideal partner was softened by the presence of his daughter—their only child and close companion from her early childhood, and drawn closer by sharing the nursing of Mrs. Standen during her long and painful illness prior to her death. My marriage with Miss Standen in 1906 led to the establishment of a mutual household and began a phase in which I derived great benefits from Standen's wide and accurate knowledge, and I cannot but feel proud in having had such a father-in-law as a constant guide and friend. The advent of a grand-daughter and later a grand-son and namesake mitigated still further the loss of his wife and Standen took the greatest interest and pride in their progress and achievements, which they reciprocated in no small degree. None knew his worth better nor had greater pride in his intellectual capabilities than his own daughter. Always her ideal, the great sympathetic bond existing between them grew stronger with the passing of years and as his failing health made him more dependent upon her. This the first separation between them and a break in our harmonious quintette will be felt for many long years.

Mr. Standen was laid to rest in the Southern Cemetery, Manchester, on the 19th of March, in the presence of members of his family and a large gathering of friends, colleagues and representatives of the Manchester University, the Manchester Museum, the Conchological and other Societies. At the conclusion of the ceremony, Dr. G. H. Carpenter, the Keeper of the Museum, paid a splendid tribute to the work and personality of our departed friend in a few well-chosen words. He concluded his eulogy by remarking: "We keep our friend in memory as an earnest enquirer who ever sought the truth while he recognised the limitations of our knowledge. Such open-mindedness and humility together with the faith that there is a rational scheme of things which may be at least partly understood by the seeking student are surely the marks of the true scientific worker, as of that childlike spirit which (we are told) 'is of the kingdom of Heaven.' And so of Standen

we may use most suitably the simply beautiful lines which Longfellow wrote long ago of the elder Agassiz:—

And Nature, the old nurse, took
The child upon her knee.
'See, here is a story-book
That thy Father has written for thee.
Come, wander with me,' she said,
'Into regions yet untrod,
'And read what is still unread
In the manuscripts of God.'

Our friend has wandered now into regions beyond our sight. May we not feel in our deeper selves that he shares still in our work and our worship?"

The following is believed to be a complete list of Standen's conchological contributions. His published papers on other subjects, including mammals, birds, insects, woodlice, chelifers, etc., to total over 90. Space cannot be spared to enumerate these here.

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 "*Limnæa stagnalis* Linn. monst. *sinistrorsum*," *Id.*, vol. 7, April, 1892, p. 41.

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- "*Pupa ringens* in Cheshire." Id., vol. 7, July, 1892, p. 89.
- "Land and Freshwater Mollusca collected around Portsalon, Co. Donegal, Ireland." Id., vol. 7, July, 1893, pp. 195-203.
- "*Vertigo substriata* Jeff. var. *albina*." Id., vol. 8, Jan., 1895, p. 11.
- "*Helix aspersa* Müll. monst. *sinistrorsum* Taylor." Id., vol. 8, January, 1895, p. 23.
- "Note on *Cypræa tessellata* (Sowb.)." Id., vol. 8, April, 1895, p. 55.
- "Obituary Notice of the late Rev. William Turner." Id., vol. 9, January, 1898, p. 16.
- "*Helix nemoralis* monst. *sinistrorsum* in Lancashire." Id., vol. 9, April, 1898, p. 58.
- "Note on *Terebra eximia* Dh." Id., vol. 9, July, 1898, p. 95.
- "Notes on the Land Mollusca of Grange-over-Sands, Lancashire." Id., vol. 9, October, 1898, pp. 113-114.
- "*Vertigo pusilla* Müll. in Lancashire and Westmorland." Id., vol. 9, April, 1899, p. 181.
- "Remarks on the cause of Abnormality in *Planorbis spirorbis*." Id., vol. 9, July, 1899, pp. 216-217.
- "*Vertigo moulinsiana* Dupuy in Cambridgeshire." Id., vol. 9, July, 1899, p. 217.
- "*Vertigo alpestris* Alder in Lancashire." Id., vol. 9, July, 1899, p. 221.
- "*Clausilia biplicata* (Mont.), white variety." Id., vol. 9, July, 1900, p. 331.
- "Report on the Marple Ramble, July 27th, 1901." Id., vol. 10, April, 1902, p. 182.
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- "Reversed Shells in the Manchester Museum." Id., vol. 11, Oct., 1905, pp. 228-236.
- "Observations on the Terrestrial Mollusca of the District around Silverdale, Lancashire." Id., vol. 11, July, 1906, pp. 325-330.

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- "*Ancylus fluviatilis* var. *gibbosa* Bourg. in Derbyshire." Id., vol. 14, July, 1913, pp. 78-9.
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VERTIGO GENESII Gredler IN IRELAND.

PART I.

By A. W. STELFOX, M.R.I.A.

(Read before the Society, February 4th, 1925).

IN 1922 a small sample of white marl came into my hands, which had been obtained by Mr. Henry Pim at Golden Grove (near Roscrea), in King's Co. The sample was stated to have been taken from a bed of marl, about one foot in thickness, resting upon peat and in turn overlain by one or two feet of peat.

These white marls, in Ireland, as a rule, contain freshwater shells in abundance, land shells being very rare or absent. The marl from Golden Grove, therefore, struck me as being remarkable, as it contained mainly a land shell fauna. Mr. Pim subsequently sent me for examination further samples of this marl bed, and of another bed which formed a lenticular patch at a lower level in the same section of peat. At the same time he forwarded a sample of another marl from the stream side at Millpark, a little more than a mile N.W. of Roscrea, where, he stated, the stream had cut its way through marl six to ten feet in depth, the bed of the stream still being in the marl. This sample from Millpark, taken from six feet below the surface, also contained numerous land shells, though the percentage of freshwater species was a little higher than in the samples from Golden Grove. Amongst the terrestrial species I obtained, was the first fossil example of *Vertigo moulinsiana* taken in Ireland; while *V. angustior*, as yet unknown to live in this part of the country, also occurred. From this and other evidence it became apparent that Mr. Pim had discovered a type of marl quite new to Ireland, and one which might be expected to yield some surprises. Moreover, it was evident that, although post-Glacial, the marls were of considerable antiquity. Mr. Pim also reported a marl "resting on the side of a hill" near Gloster, about five miles N.W. of Roscrea on the road to Birr. Samples of this last, sent me by Mr. Pim and Mr. R. A. Phillips, yielded an amazing fauna, chiefly terrestrial, amongst which *Acanthinula lamellata*—which is common—stood out as the most remarkable, as it had never been taken fossil in any Irish deposit, though widespread in the living state and always regarded as one of the oldest members of our fauna. I was unable to visit Roscrea until March, 1924, when with Mr. R. A. Phillips and guided by Mr. Henry Pim, we visited the marl deposits at Golden Grove, Millpark, Gloster and Fancraft, bringing away numerous samples to work out at home. In examining this material I discovered from the Fancraft deposit a toothless *Vertigo* (fig. 1), which was at once recognized as the species recorded from Great Britain as "*V. parcedentata* Al. Braun."

A further search yielded a small series of similar shells from Gloster, and examples of the same species bearing 3-4 teeth from Golden Grove (fig. 3)—the last laid aside temporarily as possibly a form of *V. pygmæa* Drap. One of the toothless shells I sent to Dr. David Geyer, of Stuttgart, under the name *parcedentata*, who replied:—"Your Vertigo is not *parcedentata*, but *genesii* Gredler." Dr. Geyer also kindly sent specimens of both *genesii* and *parcedentata*, and there is no doubt that the Irish shells are referable to the former, Geyer's *parcedentata* being more cylindrical and *alpestris*-shaped.

Mr. A. S. Kennard seems also to be of the same opinion, but regards both as varieties of one species (see note under *V. parcedentata* Al. Braun, in Swanton's Pocket Guide to the British Non-Marine Mollusca, London, 1906).

A few words as to the deposits from which these shells come:—

FANCRAFT. This deposit is exposed along the side of a mill-race beside Mr. Pim's House. The whole section is about four feet in depth, the upper half being composed of light porous soil, while the lower consists of a white marl resting on a bluish marly gravel, reaching down to the water level. My first specimen of *V. genesii* came from the upper layers of this marly gravel. One or two other examples and some fragments have also been obtained; all are edentate and of the slender shape shown in Fig. 1. The mill-race is not situated quite in the valley bottom, but slightly to one side and a few feet above the natural stream course. The two feet of soil above the marl probably represents hill-creep, resting upon the much older alluvial or lacustrine deposits. *Acanthinula lamellata* is very common in the white marl, which somewhat resembles a true lacustrine chara-marl, except that its fauna is largely terrestrial. The bluish gravel below suggests an early post-Glacial hill-wash and is probably the oldest deposit examined in the district.

GLOSTER. This deposit resting on the hill-side is really a calcareous tufa formed by springs, which gush out of the glacial gravels, composed mainly of the detritus of the Carboniferous limestone. Much of the material is too nodular to wash down, but luckily marly beds are to be met with from which the shells are easily washed out under a tap. The shell-fauna of the tufa is very remarkable, owing to the admixture of freshwater, marsh, dry-ground and shade-loving species. These range from *Pisidium casertanum* and *Succinea oblonga* to *Acicula lineata*, *Hygromia hispida* and *Acanthinula lamellata*. Even a single example of *Pyramidula rupestris* occurred in one sample. Indeed representatives of almost all œcological associations occur except those characteristic of open and running water and the xerophilous Helices. How this assemblage of species has come to

find a resting place in the same small sample of material is a mystery to me at present.

GOLDEN GROVE. As stated above, this deposit is interstratified with peat. In many ways it would appear to be a genuine lacustrine chara-marl deposited in situ during a pause in peat formation, but from the amount of intercalated peat and other vegetable refuse it contains, I strongly suspect that it is a re-deposited marl—a “wash out” or flood deposit—brought down by a stream now flowing across the south end of the bog in a deep channel cut by man. This cutting itself exposes a deep bed of marl, which is older than the peat.

MILLPARK. Clearly a deposit formed in a lake lying between the steep-sided moraines, which everywhere form such a striking feature of the topography. The depth of this marl is unknown, but since the present stream has cut its way through the moraines and drained the lake, it has sunk its bed into the old lake-floor to the extent of at least ten feet at one place, without exposing the base of the marl. By digging I obtained a sample from two feet below the bed of the stream, say twelve feet below the level of the surface of the meadow—only a few inches of soil overlies the marl. This sample yielded the following fauna:—*Agriolimax* sp.¹ (one shell of), *Arion* sp. (granules of), *Hyalinia cellaria*, *pura* and *crystallina* (large form), *Euconulus fulvus*, *Punctum pygmæum*, *Pyramidula rotundata*, *Helix nemoralis* (12345) 1 example, *Hygromia hispida*, *Vallonia costata*, *Acanthinula lamellata* and *aculeata*, *Pupa anglica*, *Vertigo antivertigo*, *substriata* and *pusilla*, 1 example, *Columella edentula*, *Cochlicopa lubrica*, *Carychium minimum*, *Clausilia bidentata*, *Limnæa pereger* and *truncatula* and *Pisidium hibernicum*.

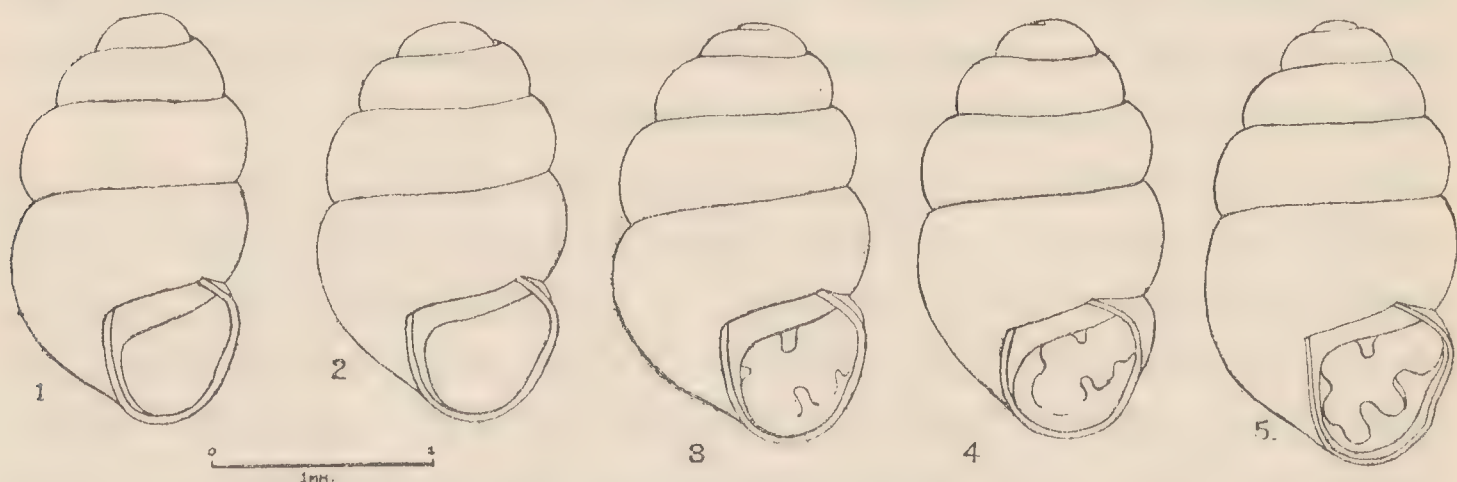


FIG. 1. *V. genesii* from marly gravel at Fancraft.

- „ 2. „ from Salten, near Bozen (the original locality) ex D. Geyer.
- „ 3. „ from marl (interstratified with peat) at Golden Grove.
- „ 4. „ from a marshy pasture near Mountmellick, Queen's Co.,
R. A. Phillips.
- „ 5. *V. pygmæa* taken in association with *V. genesii* at Mountmellick by
R. A. Phillips.

¹ Shells of this species are quite common in the marls of the district: its shape and thickness remind one of *A. levis*, but probably it represents a thick-shelled form of *A. agrestis*.

I have no doubt that in this case the land shells in the deposit represent hill-wash from the steep wooded slopes of the moraines into the shallow, often dry lake. I would suspect that the large stream which now flows through the basin did not do so in early post-Glacial times. Probably owing to the intensely calcareous nature of the deposits at this spot—both Glacial and lacustrine—the post-marl “Peat Period” is not represented by any deposit.

The full fauna of these deposits I will deal with at another time. I am greatly indebted to Mr. Henry Pim for sending me the first samples, as well as for much subsequent assistance, and to Dr. Geyer for specimens of *Vertigo parcedentata* and *V. genesii*.

PART II.

BY R. A. PHILLIPS, M.R.I.A.

AMONG some Vertigos collected in a marshy spot near Mountmellick, Queen's County, in June, 1924, there occurred a single recently-dead shell which resembled in form the fossil specimens of *V. genesii* recently discovered by Mr. A. W. Stelfox near Gloster and other places in King's Co., except that it possessed four denticles. On a visit to the same place again, late in September, several living examples of the same shell were procured and then little doubt remained of its being *V. genesii*, or at any rate something distinct from any known living British or Irish species (Fig. 4). Specimens were sent to Dr. David Geyer, of Stuttgart, who at once identified them as *V. genesii* and sent for comparison two specimens from the original habitat, an alpine pasture at Salten, near Bozen, in the Tyrol, in which Gredler had collected his type specimens. These were identical with the Mountmellick shells except that one was entirely destitute of teeth (Fig. 2) but Dr. Geyer states, in this connexion, that *V. genesii* varies and may have 0, 1, 2, 3 or 4 denticles. In two of the Mountmellick shells the outer palatal tooth is absent, in a few others that tooth is represented only by a brown spot, in the remainder all four denticles are present, as they are in Dr. Geyer's second specimen. In three sets of fossil examples I have seen, the German shells possess two or three teeth each, the Irish ones vary from none to four and the English (Apethorpe) ones are quite edentate.

The only British species with which *V. genesii* could be confused are *V. pygmæa* and *V. lilljeborgi*. Compared with *V. pygmæa*, its shell is about the same size but more glossy, less opaque and more distinctly striated; the whorls are more swollen and the suture correspondingly deeper; the nucleus is almost sunk in the second

whorl, giving the apex of the shell a flat appearance; the aperture is almost circular and scarcely constricted; the peristome is only slightly thickened and not furnished with a reflected outer lip; the denticles, when present, do not exceed four in number, they are smaller, brown in colour, more deeply seated and the shell is not thickened at the place of their insertion as in *V. pygmæa*. The animal is much darker in colour than *V. pygmæa*, being quite black, the tentacles also are black and stouter than those of *V. pygmæa*.

The shell of *V. lilljeborgi* is larger, smoother, paler and more ventricose, the upper whorls being smaller and the body whorl larger in proportion to its size than those of *V. genesii*.

The Mountmellick habitat is a narrow strip of wet ground (sometimes grazed by cattle and donkeys) cut off from a damp natural meadow by a drain, covered with a dense growth of short grass and sedge with a mixture of Bog-bean, Meadow Sweet, Spotted Orchis, dwarfed Willows and other moisture-loving plants. The mollusca associated here with *V. genesii* are *V. moulinsiana*, *V. pygmæa*, *V. antivertigo*, *V. substriata*, *Pupa anglica*, *Agriolimax lævis*, *Hyalinia crystallina*, *H. nitidula*, *H. pura*, *H. radiatula*, *Zonitoides nitidus*, *Euconulus fulvus*, *Punctum pygmæum*, *Hygromia hispida*, *Vallonia pulchella*, *Cochlicopa lubrica*, *Succinea pfeifferi*, *Carychium minimum* and *Limnæa truncatula*. In a drain close by *Planorbis corneus* and *Bithynia leachi*, two rare species in Ireland, live together.

Dr. Geyer has kindly written us "The recent distribution of *V. genesii* is, so far as I know, as follows—

TYROL—Salten (an alpine pasture) near Bozen (loc. orig.): Tret in Nonsberg in S. Tyrol (like Bozen now in Italy).

GERMANY—Wolfegg, Kisslegg and Ratzenried in Wurtembergian Allgau; Isar rejectamenta (alluvium) near Munich; Tegel near Berlin (Archiv für Mollusken-kunde 1921, pp. 265-278. Messrs. Lohmander and Schmierer have erroneously recorded it as *V. lilljeborgi*, but later recognized their mistake and changed to *V. genesii*).

LITHUANIA—Cichowola on the upper Narew.

SWEDEN—Östergötland (sent me by Lohmander); Jemtland (from Lindholm of Petersburg), fossil.¹

RUSSIA—Moscow (according to Milachevich).

I suggest that the species is really more widespread, but has been confounded with *lilljeborgi*."—D. GEYER.

¹ "Westerlund gives (Exposé critique p. 98) also Westergötland and in the Synopsis p. 63 also Jemtland. Hägg (Bull. Geol. Inst. Univers. Upsala, vol. 8, 1906-07, pp. 229-273) questions the recent occurrence in Jemtland, but says that the shell reaches Dalarne." D. Geyer

ALBINISM IN THE EUROPEAN CLAUSILIIDÆ.

BY J. R. LE B. TOMLIN, M.A.

(Read before the Society, May 2nd, 1925).

A PAPER on this subject appeared in the *J. of C.* last year, pp. 170-173. Since then I have come across an exhaustive paper on the same subject by ¹Boettger, and as his list of albinos may not be readily accessible and doubles the number of species given as above, I think it is worth quoting.

The additional forms are as follows:—

C. bielzi Pfr. subsp. *madensis* Fuss var. *albina* Bz.—Mada (Siebenbürgen).

C. fimbriata Rm. var. *albina* Bttg.—Various localities in Carinthia and Croatia.

C. grossa Rm. f. *melanostoma* A. Schm. var. *albina* Tschapeck.—Steiermark.

C. grossa f. *inæqualis* A. Schm. var. *albina* Bttg.—Croatia.

C. commutata Rm. f. *ungulata* A. Schm. var. *albina* Pfr.—Carinthia and Steiermark.

C. porroi Pfr. var. *albina* Bttg.—Corsica.

C. accedens Mllff. var. *albina* Bttg.—Serbia.

C. grohmanniana Rm. var. *albina* Bttg.—Sicily.

C. gibbula Rm. var. *albina* Bttg.—Dalmatia.

C. vulcanica Ben. var. *albina* Bttg.—Sicily.

C. pelagosana Bttg. var. *albina* Bttg.—Pelagosa Island.

C. ornata Rm. var. *albina* Tschapeck.—Steiermark.

There is also a var. *albina* Tsch. of the f. *producta* A. Schm.

C. itala Mts. f. *brauni* Rm. var. *albina* Gredler.—Tyrol and N. Italy.

The f. *latestriata* Chp. has also been found albino.

C. stentzi Rm. f. *rossmässleri* Pfr. var. *albina* A. Schm.—Carinthia.

C. stentzi Rm. f. *funki* Gredler var. *albina* Gredler.—Tyrol.

C. stentzi Rm. f. *letochana* Gredler var. *albina* Gredler.—Tyrol.

C. conspurcata Jan var. *albina* Bttg.—Knin.

C. notabilis K. var. *albina* Bttg.—Obbrovazzo.

C. satura Rm. var. *albina* Brus.—Kistanje.

C. robusta K. var. *albina* Bttg.—Zirona Island.

C. semirugata Rm. f. *vibex* Rm. var. *albina* Bttg.—Dalmatia.

C. planilabris Rm. var. *albina* Bttg.—Dalmatia.

- C. alschingeri* K. var. **albina** Bttg.—Zara.
C. negropontina Pfr. var. **albina** Bttg.—Euboea Island.
C. turgida Rm. var. **albina** Bttg.—Hungary.
C. duboisi Chp. var. **albina** Bttg.—Transcaucasia.
C. striolata Pfr. var. **albina** Tsch.—Steiermark.
C. schmidtii Pfr. f. **rablensis** Gall. var. **albina** Gredler.—Carinthia.
C. parvula Studer var. **albina** Bttg.—Swabian Alps.
C. dubia Drap. f. **speciosa** A. Schm. var. **albina** Gredler.—Steiermark.
C. pumila Pfr. var. **albina** Bttg.—Siebenbürgen.
C. pumila f. **sejuncta** A. Schm. var. **albina** O. Schm.—Weimar.
C. densestriata Rm. var. **albina** Bttg.—Carniolia.
C. badia Rm. var. **albina** Tsch.—Steiermark.
C. filograna Rm. f. **transsylvanica** A. Schm. var. **albina** Bttg.—Siebenbürgen.

Three of Mr. Dean's new varieties appear to be anticipated by the following :—

- C. substricta* Pfr. var. **albina** Bttg.
C. comensis Sh. var. **albina** Gredler.
C. cruciata Studer var. **albina** Weinland.

Boettger also mentions the following species of which a dextral monstrosity is known :—

- C. stentzi* Rm. f. **rossmässleri** Pfr.
C. almissana K.
C. macarana Rm.
C. bidens L.
C. duboisi Chp.
C. bidentata Ström.

To these may be added :—

- C. biplicata* Mont. *J. of C.*, xvi, 271.
C. plicatula Drap. *Pr. Malac. Soc.*, vi, 270.
C. parvula Studer. *Bull. Soc. Mal. France*, ii, 95.
C. laminata Mont. }
C. rugosa Drap. } *Bull. Soc. Zool. France*, xxxix, 59.
C. plicata Drap. }
C. leucostigma Rm. *Mitt. Nat. Ver. Aschaffenburg*, vi, 75.

In *Bull. Soc. Zool. France*, l.c., *Balea perversa* L. is recorded dextral, and *Clausilia livida* Mke. sinistral, in the same work, p. 57.

NOTE ON THE HABITS OF *HYGROMIA FUSCA* (Montagu).

By W. E. ALKINS, M.Sc.

(Read before the Society, December 3rd, 1924).

THE writer was somewhat surprised when collecting in Forge Valley, near Scarborough, on August 21st, 1923, to come across a small and local colony of *H. fusca* (Mont.); the shells were actually on the ground, although the locality was on a wooded hillside with abundant trees. The experience was repeated on August 9th of the present year in Ashwood Dale, near Buxton, where a much more numerous colony occurred; here also small trees were abundant. The finding of this species active on the ground or on low-growing plants in well-wooded stations in August, when it appears as a rule to be geophobous or anabatic in its habits, led the writer to look up his own other records and also such published accounts as were accessible.

J. W. Taylor (Monogr. L. and F. W. Moll. Brit. Is., iv, 50) says that:—" *Hygromia fusca* is found fairly commonly in districts where it occurs, living upon the sedges bordering the streams in moist or damp woods, and is a habitual climber, especially in the early autumn months, ascending the alder, beech, poplar, hazel, osier, juniper, mountain-ash, and other trees, feeding upon the leaves and clinging to their undersides. It also frequents many plants, especially the great hairy wood-rush (*Luzula sylvatica*), the meadow sweet (*Spiraea ulmaria*), campion (*Lychnis dioica*), dog mercury (*Mercurialis perennis*), *Iris*, *Equisetum*, nettles, sedges, ferns, brambles, etc., and is easily collected by shaking shrubs or the lower branches of trees over an umbrella.

"It is a very hardy species, and in late autumn and winter is remarkably active and more geophilous in habit, living amongst the decayed leaves and herbage.

"Though evidently feeding on a great variety of plants, Capt. Farrer finds that in the Lake district its favourite food is wild carrot (*Daucus carota*).

"Mr. Masefield has noticed its marvellous protective resemblance to the decaying seed capsules of the campion (*Lychnis dioica*), the thin shell being the exact colour of the capsule when wet, and the base being of a pale yellow colour exactly resembles a portion of the viscera of the snail as seen through the shell."

G. W. Chaster (*J. Conch.*, vii, 78) records the taking of "*Helix fusca* on the leaves of the Meadowsweet" in Merionethshire in June, 1892. J. G. Milne and C. Oldham (*ibid.*, 319, 325), in their paper on the Bowdon district of Cheshire, give it from "Ashley, Cotterill

Clough, among *Luzula sylvatica*, not uncommon," and say that it "belongs to gravelly or alluvial deposits." W. J. Farrer (*J. Conch.*, viii, 157), writing of the English Lake District, says that *H. fusca* is "very abundant throughout wherever sedgy banks border the swiftly running 'becks.' During the summer dead shells only can be found; about the beginning of September the young snails put in an appearance, and in about six weeks more and up to April the adult shell may be found in plenty. The favourite food seems to be the wild carrot" (cf. above). In Somersetshire (E. W. Swanton (*J. Conch.*, ix, 197) it is "a very local species, frequenting hedge-banks," while A. G. Stubbs (ibid., 325) had, in the Tenby district, "taken them most plentifully from among the fallen leaves of the Mountain Ash in the late autumn; in the summer they are found among nettles and long grass." H. Beeston and C. E. Wright (*J. Conch.*, xi, 76) found it "very rare" near Ilfracombe in August, 1903; they recorded "two live specimens among herbage on Berrynarbor Road, and one other live one in Chambercombe Woods."

An interesting account is given by R. Standen (*J. Conch.*, xi, 328), describing his experience at Silverdale, Lancs., in September and October, 1905:—"On one occasion, whilst 'beating' the tall junipers on Arnside Knot, I was somewhat surprised when a number of fully-grown *Hygromia fusca* came tumbling down into the umbrella. . . . Most of my conchological friends, I find, look upon *H. fusca* as a ground-loving species, with a special liking for the Great Hairy Wood-rush (*Luzula sylvatica*) and—the testimony of authors notwithstanding—it is not generally credited with more than adventuring upon an occasional excursion over the grass and other herbage, and I have often heard expressions of surprise at failure to find it during summer in some of its well-known haunts. As a matter of fact, this snail is a habitual climber, and ascends trees, chiefly beeches and poplars, but more particularly alders, where it lives during the summer months, clinging to the undersides of the leaves, and feeding upon them, and falls to the ground with them in September and October. It then occupies itself with the business of reproduction, laying its eggs amongst the dead leaves, and thus it is we find it most commonly and remarkably active during the late autumn and winter months or very early spring."

D. Bacchus (*J. Conch.*, xvi, 286) records from Leigh Woods (Somerset), near Bristol, a form of *H. fusca* which is "darker in colour" than and "not so thin" as the usual north of England form. He says:—"The only cause of this heavier calcification and redder colour that I can think of is the limestone soil and the amount of dead beech leaves about on which the mollusc appears to feed. The

bank on which this shell is found is a limestone one facing north and very damp, but sheltered both above and from the opposite side of the road by trees. It is some six feet high, sloping at an angle of 45 degrees. The limestone cropping out here and there makes pockets which most of the year are filled with leaves. Above the bank is a mixed hedge of laurel, beech, birch, oak, sycamore, hawthorn, with a few furze bushes. The bank is covered with thick grass, the only other plant of note being the wild thyme." N. G. Hadden (*J. Conch.*, xvii, 73) states that *H. fusca* "occurs in woods throughout West Somerset, but is not abundant. It is fairly often to be found among *Luzula maxima* in Culbone Woods and Badgworthy Valley."

In the 1921 edition of the Census (*J. Conch.*, xvi, 172) the species is recorded from 86 vice-counties; the main features characteristic of its habitats and distribution are summarised as follows:—"Woods, damp wild places, cliffs, etc., especially in autumn and winter; western and northern to Sutherland; very rare or absent in south-east England; generally in Ireland except central."

In North Staffordshire *H. fusca* is very local, though apparently more frequent than has been thought. It occurs in North Wood, Ramsor, among beeches and hazels; the dominant member of the ground flora is the dog's mercury (*Mercurialis perennis* Linné), while the common campion (*Lychnis diurna* Sibth., = *L. dioica* a Linné) is abundant. The wood faces north, and the underlying limestone breaks through the surface in many places. The shells here are noticeably less fragile than those from other Staffordshire stations, some four of which are known, all on Millstone Grit rocks. Of these perhaps the most interesting are two distinct stations in Star Wood (Cotton Hollow), Oakamoor; the discovery of the species here in December, 1919, and January, 1920, confirmed an old record of R. Garner (*Nat. Hist. of County of Stafford*, 1844). The former colony occurs in a wet shaded area planted with poplars; the common campion occurs here, but the shells are usually found not on it but on very much decayed stems of the common butterbur (*Petasites vulgaris* Desf.) or on dead nettle (*Urtica dioica* Linné) stems. The later-noted colony occurs about half a mile higher up the valley, among brambles, under willows and alders; both the common campion and the meadowsweet (*Spiræa ulmaria* Linné) occur. The shells in both loci are scarce and extremely thin and fragile. The two stations at Consall are essentially similar: both are in damp, wooded localities; shells are scarce and very local. Records have been made from late September—in one case at North Wood, Ramsor, numerous mature shells were taken on October 10th—until the end of March, but dead shells only have been found from April to August.

The Forge Valley colony already mentioned seemed to be very local; shells were relatively few in number and not full-grown. The species occurred on the ground amongst *Luzula maxima* DC. (= *L. sylvatica* Gaud.). In Ashwood Dale a very numerous but local colony was found on the south side of the by-road near the river Wye, at the foot of Topley Pike; the shells were on the upper surface of leaves of the meadowsweet, at a height of about fifteen to thirty inches from the ground. Both stations are well-wooded. The Ashwood Dale shells were of two forms, one perhaps very slightly darker in colour than usual, the other of a very pale greenish colour. The animal in the case of the pale form was of normal colouring, and the shells cannot therefore be allocated to the variety *vitrea* Farrer (*J. Conch.*, viii, 157); the form is perhaps worthy of a varietal name, though the shell without the animal can probably not be differentiated from that of the variety *vitrea*.

It is clear that *H. fusca* is confined to old woodlands and other habitats where it is quite immune from the interference of man. A. E. Boycott (Trans. Herts. Nat. Hist. Soc., xvii, 240, footnote) groups it with *Limax tenellus* Müller: both species are "winter-breeders and annuals," and they "will not tolerate cultivation." *H. fusca* may thus be classed as a "really wild" species ("obligatory feral"; cf. loc. cit., 236). Whether the life cycle of the species is such that it is fatally disturbed by some of the consequences of cultivation, or whether cultivation affects the mollusc directly by promoting drying of its habitats or indirectly by favouring some living enemy of the animal or of the eggs, is not known.

It is evident too that the shell is in general to be found most abundantly and reliably on the ground in late autumn and winter, say from October to March. Adult specimens are most common from October to December or January, dying off after pairing and egg-laying are ended. In summer the species is scarce and sometimes not to be found on the ground in woodland habitats where it is known to live, and this appears to be due to a habit of ascending trees and shrubs and living amongst the leaves; it is quite evident, however, that the tree-climbing habit is not invariably followed even where suitable trees abound.

A. E. Boycott (loc. cit., 239) makes a very necessary distinction between geophobous species, such as *B. perversa* (Linné), *J. cylindracea* (DaC.), and *P. rupestris* (Drap.), which have their homes on walls and trees, away from the ground, and anabatic species, such as *Cl. bidentata* (Ström), *E. obscura* (Müller), which "climb trees freely in wet weather, and may stop there several days, but have their real homes on the ground." *H. fusca* is clearly not geophobous in the

same sense as the three species just instanced: it spends most of its adult life on the ground; it is sometimes found on the ground in woodland habitats even in spring and summer; and finally it is occasionally found in wild but treeless places, where it cannot climb if it would. Nor is it anabatic in the same way (and therefore presumably for a similar reason) as *Cl. bidentata* and *E. obscura*; its climbing is apparently independent of weather conditions.

It seems unlikely that the shells find in the trees some food that is not available on the ground below, and the likeliest explanation of their seasonal climbing would appear to be that they avoid by this expedient the attentions of some enemy which cannot or at any rate does not itself climb. It may be significant that at the season when tree-climbing is the rule the snails are immature: full-grown shells may be able to withstand the attacks of the hypothetical enemy. The seasonal prevalence of the habit would however be equally well explained if the enemy itself were active only in spring and early summer. If it were in addition widespread but not ubiquitous in its distribution, the ascertained distribution and habits of the snail would follow at once.

The problem is obviously complex: its solution can be expected only from a detailed knowledge of the live history and relationships of the snail, which is at present lacking.

Albinism in the European Clausiliidæ.—Mr. J. Davy Dean (*J. of C.*, xvii, 171) invites additions to his list of European albino Clausilias. I can supply the following from my own collection:—1. (*Alinda*) *biplicata* Mont. var. *albina* Bttg.: Heidelberg.—I was under the impression that this form is common, and was surprised not to find it in Mr. Dean's list. 2. (*Delima*) *cattaroensis* Zieg.; Cattaro.—Pure translucent white. 3. (*Delima*) *biasoletiana* Charp.—Trieste. 4. (*Marpessa*) *fimbriata* Mühlf. var. *pallida* Bttg.; Croatia.—A true albino. 5. (*Alopi*) *canescens* Charp. var. *haueri* Bielz; Donghavas Mt., Transylvania (now no doubt Roumania).—Eight beautiful specimens of this very rare form, in all ages, occurred to me in September, 1912, associated with nine specimens of the form *proxima* Kim., and the typical form of *haueri*, all on the same great boulder of Limestone rock.—A. H. COOKE (*Read before the Society*, February 4th, 1925).

***Helix aspersa* Müll., new to Kincardineshire** (Vice-County No. 91).—On August 18th, 1924, whilst cycling past Gourdon, Kincardineshire, on the main road between Dundee and Aberdeen, I located a colony of *H. aspersa* Müll. on the low, loosely built stone wall bordering the west side of the road. These molluscs were sufficiently numerous to deserve the title of "common," and were associated with *H. hortensis*. No *H. nemoralis* were found. The wall at this point was covered with patches of the dainty "Maiden Pink" and other creeping plants, and the shells referred to were found hidden beneath these plants, as also in the open crevices of the wall itself. Specimens of *H. aspersa* from this station have been added to the Society's Cabinet.—E. CRAPPER (*Read before the Society*, Nov. 5th, 1924).

ON A COLLECTION OF MOLLUSCA FROM THE CAMEROONS.

By GEO. C. SPENCE.

(Read before the Society, April 4th, 1925).

TOWARDS the end of 1924 Mr. F. M. Dyke paid a flying visit to the Cameroons. His stay there was short, but he found time to gather a number of molluscs and to make his usual careful notes with regard to habitat, etc. All were taken within 25 miles of Victoria, so that only a very small portion of the country was touched, but even in this restricted area conditions, geographical and climatic, vary greatly. Thus at Debundsha on the coast and usually enjoying pleasant sea breezes there is an average rainfall of 450 inches per annum whilst Tiko, some 30 miles away, hidden amongst hills and mangrove swamps has a hot and sticky climate and an average rainfall of 100 inches. Buea, again, only a few miles off is situate 3,000 feet up the Cameroon Mountain and has quite a European climate.

Snails are found freely in plantations of cocoa, oil palms, etc., but appear to avoid manico or cassava—possibly on account of the presence of prussic acid in the leaves.

A number of the specimens were preserved in spirit. These have been submitted to Mr. Hugh Watson for examination, the results of which will probably be published in due course.

A list of the species taken follows below:—

Tiko:

Thais coronata Lam. A curiously stunted form (approx. long. 28 mm., lat. 23 mm.) on iron pillars of pier in brackish water.

<i>Limicolaria numidica</i> (Rve.) and form <i>unicolor</i>	} Plentiful on banana leaves.
<i>Limicolaria martensiana</i> Smith	

Buenga:

<i>Callistoplepa barriana</i> (Sow.)	} In oil palm and cocoa plantations and along the road to Buea.
<i>Limicolaria aurora</i> (Jay)	
<i>Pseudotrochus solimanus</i> (Mor.)	
<i>Pseudoglessula retifera</i> (Mts.)	
<i>Edentulina martensi</i> (Sm.)	
<i>Trochozonites reticulatus</i> D'Ailly	
<i>Thiara (Melanoides) dykei</i> n.sp.	

Mohive, near Victoria:

<i>Achatina marginata</i> Swainson	} Under dead leaves in plantation.
<i>Thiara (Melanoides) dykei</i> n.sp.	

Mokundange:

<i>Trochozonites lindstromi</i> D'Ailly.	One example from tree roots in plantation.
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Debundsha :

Limicolaria martensiana Sm. Very abundant in grass. All taken alive. A number of shells have holes worn right through the whorls, but apparently no attempt has been made to effect repairs. I list these specimens as *martensiana* from which they are indistinguishable, but they also agree well with other described species. It is well-known that there are far too many so-called species of *Limicolaria*.

Isongo :

Achatina marginata Swainson
Subulina angustior Dhn. } By native paths.

Misse Uele, near Tiko :

Achatina marginata Swainson.

Callistoplepa barriana (Sow.). One example together with eight of its large white calcareous eggs.

Limicolaria numidica (Rve.) and form *unicolor*, together with a batch of ten yellowish eggs. These snails do much damage to young seedlings in plantations.

All from a cocoa plantation.

Victoria :

Achatina iostoma Pfr. Bussungu Farm. Two immature examples.

Pseudotrochus solimanus (Mor.). In cocoa plantation.

Subulina angustior Dhn.

Pseudoglessula clavata (Gray)

one juvenile

Streptostele buchholzi Mts.

Trochozonites reticulatus D'Ailly

T. folini (Mor.) var. *percarinatus*
 (Mts.)

Succinea catena n.sp.

Pleuroprocta pleuroprocta (Mts.)

} Under dead leaves and stones
 in shady corners in the Botanical Gardens.

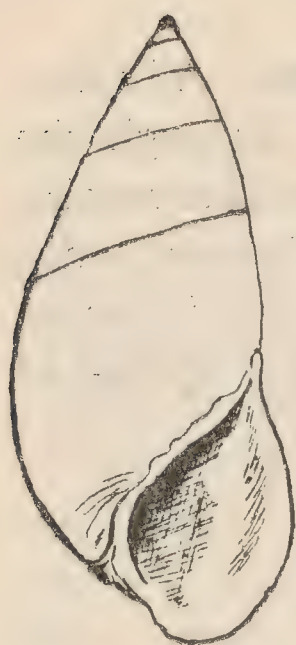
Lanistes libycus (Mor.). Under water lily leaves in backwater or R. Limbi in Botanical Garden.

T. folini percarinatus was also found climbing trees and is a very amusing "cocky" little beast, with a long "whip" on its tail which is waved freely as it moves.

Appended are descriptions and figures of the two new species :—

Thiara (Melanoides) dykei n.sp. (fig. 1).

Shell rather large, obese fusiform, imperforate, solid and thick. White (sometimes showing one or two purple-brown bands) and in live condition covered with a uniform yellow-brown epidermis through which the above-mentioned dark bands show faintly. Apex small, involute. Whorls six, almost flat but becoming concave on



Thiara (Melanoides) dykei n.sp.

the upper part of the last half of the body-whorl. Sculptured with fine regular hair-like curved longitudinal striae, crossed by still more closely placed waved spiral striae. This sculpture extends over the base, the spirals becoming stronger as they approach the columellar region. Suture linear. Aperture auriform, vertical, peristome simple, thickened within. Outer lip concave above, curved outward below and having the base expanded to form a slight spout-like elongation. Columella rather short, strongly curved and merging into the base. Callus thick, continuous up the columella and across the paries.

Long. 39.5 mm.; lat. 17 mm.; aperture, alt. 18.75 mm.; lat. 10 mm. Length of last whorl 27 mm.

Type locality: Buenga, Cameroons.

The type specimen has been selected as the largest retaining the apex out of a number of examples all of which are, unfortunately, dead and bleached. It, however, retains a few filaments of epidermis which are sufficient to confirm its agreement with a half-grown decololate example from Bitze kindly lent me by Major Connolly from which above details have been taken.

There is a well-grown specimen of this species in the British Museum from Efulen, S. Cameroons, retaining only the last two whorls which have a major diameter of 22 mm.. Aperture 23.3×11 mm. Length of last whorl 31 mm.

Succinea catena n.sp.
(fig's 2, 3).



2

3

Shell small, transversely oval, thin with obtuse apex, polished, shining. Opaque white with irregular transparent patches. Whorls $2\frac{1}{2}$, rapidly increasing, the first $1\frac{1}{2}$ forming the much depressed spire and encircled with eight light chain-like bands formed by a series of rings in contact one with another on a darker background. The large body whorl shows only curved regular growth lines. Suture plain. Columella narrow and curving up into the shell, the whole interior of which is visible when viewed from the base. Lip thin, slightly curved and strongly retracted posteriorly. Aperture piriform.

Long. 6.5 mm.; diam., max. 4.5 mm.; aperture, alt. 5.5 mm.; lat. 4 mm. Locality: Victoria, Cameroons.

A beautiful little shell and far more distinctive than usual in the genus. The sharply recurved lip recalls *Curvella*. The animal is "very active in sunlight but sluggish in the dark." The specimens are sexually mature and probably full grown.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

ANNUAL REPORT (1924) OF THE YORKSHIRE BRANCH.

TEN Meetings have been held during the year. The five winter meetings were devoted to lectures and general exhibits. Prof. P. F. Kendall, M.Sc., F.R.S., contributed a paper on "The Conchology of the British Seas in the later Tertiary Period." Prof. W. Garstang, M.A., D.Sc., F.Z.S., lectured on "The Larval Shells of Mollusca," and Mr. E. Percival, B.Sc. (of the Leeds University), gave an interesting account of "The Molluscan Foot," illustrated by a large number of specimens preserved in spirit. Among the exhibits may be mentioned a special display of *Helix caperata* from numerous localities, and general exhibits were shown at all ordinary meetings. The field meetings during the year have been fairly successful. The ecological investigation of the canal at Rodley has been further pursued, and several visits have been made to various localities in the neighbourhood. The Society regrets having to record the retirement from the position of Hon. Secretary of Mr. Fred Booth, who has so well and faithfully served the Branch throughout a period of over 20 years. The good wishes of the Society go with him to his new home in Queensland. At the March meeting held in Leeds Mr. Booth was presented with a purse wherewith to purchase a Colonial outfit. In making the presentation Mr. J. W. Taylor, M.Sc., referred to the valuable services rendered by Mr. Booth, not only to the Society but to the Science of Conchology in general. He has been elected an Hon. Life Member of the Branch. It has been decided to change the name from "Leeds Conchological Club" to "The Yorkshire Conchological Society." Mr. F. Rhodes, F.E.S., of Bradford, is our President.

J. DIGBY FIRTH,
(Acting) Hon. Sec.

532nd Meeting, held at the Manchester Museum, November 5th, 1924.

Mr. G. C. Spence in the chair.

Donation to Cabinet.

Series of Marine and Non-Marine shells from the Roman excavations at Folkestone (presented by Mr. A. K. Lawson).

Candidates Proposed for Membership.

Dr. George Herbert Carpenter, M.R.I.A., Keeper of the Manchester Museum (introduced by R. Standen and J. W. Jackson).

Miss W. S. S. van Benthem Jutting, Conservator at the Zoological Museum Aquarium, Plantage Middenlaan, Amsterdam, Holland (introduced by Dr. W. G. van der Sleen and J. W. Jackson).

Papers Read.

"Marine Mollusca of Dinard," by J. W. Vaughan.

"Distorted *H. itala* at Folkestone," by A. K. Lawson.

"Shells from Roman Excavations at East Cliff, Folkestone," by A. K. Lawson.

"*Helix aspersa* new to Kincardineshire," by E. Crapper.

"*Vertigo moulinsiana* in Middlesex," by C. Oldham.

Exhibits.

By Mr. A. K. Lawson :—Specimens to illustrate his notes, and that of Mr. E. Crapper.

By Mr. C. Oldham :—*Vertigo moulinsiana* and *antivertigo*, from Harefield, Middlesex, to illustrate his note.

By Mr. G. C. Spence (for Rev. L. W. Grensted) :—*Tiara morchii* (Reeve) from Ho, Togoland (coll. Rev. A. H. Candler, 1923).

533rd Meeting, held at the Manchester Museum, December 3rd, 1924.
Mr. G. C. Spence in the chair.

New Members Elected.

Dr. G. H. Carpenter.

Miss W. S. S. van Benthem Jutting.

Candidate Proposed for Membership.

Sydney George Finch, M.Q.M.S., 31, Gunter Grove, Chelsea, London, S.W. 10 (introduced by J. C. Dacie and A. S. Kennard).

Members Deceased.

M. Cossmann.

G. K. Gude.

Resignation.

W. H. Western.

Papers Read.

"*Gyraulus acronicus* Fér. at Oxford," by A. E. Ellis.

"Note on the Habits of *Hygromia fusca* (Montagu)," by W. E. Alkins, M.Sc.

"Notes on the Mollusca of Stalybridge," by C. H. Moore.

Exhibits.

By Mr. C. H. Moore :—Large series of shells to illustrate his paper.

By Mr. G. C. Spence :—*Testacella haliotideia* from his garden at Sale, Cheshire.
The Special Exhibit was *Streptaxis*.

534th Meeting, held at the Manchester Museum, January 7th, 1925.
Mr. G. C. Spence in the chair.

New Member Elected.

Sydney George Finch.

Resignation.

Miss Lucia D. Carro.

Paper Read.

"Was *Clausilia bidentata* Auct. described by Ström?" by Fridthjof Ökland.

Exhibits.

By Mr. J. Wilfrid Jackson :—*Hygromia striolata*, *Helicigona arbustorum* from Hutton John, near Penrith, Cumberland (coll. the late Miss C. Wood, April, 1904).
The Special Exhibit was *Magilus*.

535th Meeting, held at the Manchester Museum, February 4th, 1925.
Mr. G. C. Spence in the chair.

Candidates Proposed for Membership.

Kenneth Ironside Anderson, "Hortensia," Lennox Road N., Southsea (introduced by Walter Gyngell and C. J. Mogridge).

J. Gordon Dalgliesh, 50, Tisbury Road, Hove (introduced by J. R. le B. Tomlin and J. W. Jackson).

Member Deceased.

W. H. Whitelock.

Papers Read.

"Albinism in the European *Clausiliidæ*," by the Rev. Dr. A. H. Cooke.

"*Vertigo genesii* Gredler in Ireland," pt. i, by A. W. Stelfox; pt. ii, by R. A. Phillips.

"*Helix draparnaudi* Shepp., and *Planorbis draparnaldi* Jeff.," by A. E. Ellis.

"Occurrence of *Helix aspersa* on Granite," by C. H. Moore.

"The genus *Pupilla* in the Upper District of the River Viska," by Berthold Sundler.

Exhibits.

By Mr. A. W. Stelfox:—Specimens of *Vertigo genesii* from Ireland and the continent; *V. parcedentata* from Frankfurt-on-Main; *V. pygmæa* from Queen's Co., Ireland; and *V. moulinsiana* from Golden Grove, King's Co., Ireland, to illustrate his paper.

By Mr. A. E. Ellis:—*Gyraulus acronicus*, R. Thames, Godstow, and *Gyraulus albus*, R. Welland, Market Harboro'.

By Mr. C. H. Moore:—Specimens to illustrate his paper.

By Mr. E. R. Brown:—Two trays of *Oliva*, including many fine species and varieties.

The Special Exhibit was *Chilina*.

536th Meeting, held at the Manchester Museum, March 4th, 1925.

Mr. G. C. Spence in the chair.

New Members Elected.

Kenneth Ironside Anderson. J. Gordon Dalglish.

Candidates Proposed for Membership.

Jacques Savès, 1, Côte Pavée, Toulouse, France (introduced by H. Schlesch and W. T. Elliott).

Douglas Blair Macaulay, Heatherlie, Crosby Road N., Waterloo, Liverpool (introduced by H. Coates and R. C. Moore).

Members Struck off the List.

The names of certain members of the Society were read out as having been struck off the Membership Roll, in accordance with Rule IV, in consequence of the non-payment of arrears of their subscriptions.

Exhibits.

By Mr. J. D. Dean:—*Hyalinia nitidula* from the crop of a Golden Pheasant in the Isle of Bute (the specimens were donated to the Society's Cabinet).

By Mr. C. H. Moore:—Species of *Acavus*; also *Helix arbustorum* from Nevin, and *H. aspersa* and *H. caperata* from Pwllheli.

By Mr. J. W. Jackson:—Tubes containing the glochidia of *Anodonta cygnea* attached to the Ten-spined Stickleback (collected by W. H. Heathcote, at Longton, near Preston, Lancs.).

The Special Exhibit was *Papuina*.

537th Meeting, held at the Manchester Museum, April 4th, 1925.

The President, Mr. Henry Crowther, F.R.M.S., in the chair.

New Members Elected.

D. Blair Macaulay. Jacques Savès.

Candidates Proposed for Membership.

William Dickson Lang, M.A., Sc.D., British Museum (Natural History), Cromwell Road, London, S.W. 7 (introduced by J. W. Jackson, A. T. Hopwood and J. R. le B. Tomlin).

Dr. Douglas P. Blair, Heatherlie, Crosby Road N., Waterloo, Liverpool (introduced by Miss M. C. Moore and R. C. Moore).

Roland Garnett, 91, High Street, Banbury, Oxon. (introduced by J. W. Jackson and F. Taylor).

Members Deceased.

Robert Standen. J. M. Williams.

Votes of condolence with the relatives were passed unanimously.

Illustration Fund.

The President thought that it was desirable that papers published in the *Journal* should be illustrated wherever possible, and he proposed that an Illustration Fund be instituted. He, himself, was prepared to subscribe £2 towards the Fund. The resolution was seconded and duly carried. Subscriptions to the Fund should be forwarded to the Hon. Treasurer.

Papers Read.

"Obituary Notice: Robert Standen," by J. Wilfrid Jackson, M.Sc.

"Obituary Notice: John Michael Williams," by J. Wilfrid Jackson, M.Sc.

"Additional Notes on the Land and Freshwater Mollusca of Sussex," by Maud and Gordon Dalglish.

"On a Collection of Mollusca from the Cameroons," by G. C. Spence.

Exhibits.

By Mr. G. C. Spence: Specimens from the Cameroons, collected by Mr. F. M. Dyke, to illustrate his paper.

By Mr. H. Crowther: *Limnaea pereger* and *L. stagnalis* (curious forms) from Osmondthorpe; an interesting associated group of varieties of *Helix aspersa*, *H. nemoralis* and *H. hortensis* from a small patch of hedgerow at Truro.

The Special Exhibit was *Phasianella*.

Shells from the Roman Excavations at Folkestone.—During a visit to Folkestone in August, 1924, I took the opportunity of visiting the excavations on the East Cliff, and whilst there noticed that hundreds of shells were to be seen amongst the rubbish tipped over the cliff edge from the diggings. I made a small selection of these, and have no doubt many other species might be found by careful search. The following list includes species seen embedded in the earth sections bordering the cleared Roman Walls, which are only some two feet or so beneath the present surface:—*Ostrea edulis*, *Patella vulgata*, *Mytilus edulis*, *Littorina littorea*, *Purpura lapillus*, *Helix aspersa*, *Helix nemoralis*, *Hygromia striolata*. Specimens of all these have been added to the Society's Cabinet.—A. K. LAWSON (Read before the Society, Nov. 5th, 1924).

Hyalinia nitidula (Drap.) in **Golden Pheasant's Crop.**—It may be of interest to record two examples of the above as having been taken from the crop of *Chrysolophus pictus* L., in the Island of Bute. Specimens go into the Society's Cabinet.—J. D. DEAN.

A note on *Helix nemoralis* L.—Those interested in the band variation of this species will know how very infrequently there is any coalescence between the third and fourth bands, or rather, how infrequently the formula is recorded. The truth only becomes apparent on examination; the variety is *difficult to recognise in the field* and only a lucky change of mind enables me to record a shell with the formula 02(34)5 from St. Fagan's, Glamorgan. This shell is identical with Fig. 356 in Taylor's Monograph, Vol. iii, and is perhaps more correctly understood, under the Sauveur system, by the formula 02—(34)—5.—J. D. DEAN.

EDITORIAL NOTES.

PROFESSOR COCKERELL asks me to insert the following :—" *Trishoplita goodwini* (E. A. Smith).—Prof. H. A. Pilsbry informs me that this is the correct name for the snail collected at Tsuruga, Japan, and recorded in *J. Conch.*, March, 1924, p. 115, as doubtfully *Eulota kyotensis*. The shells are very like *Eulota similis*, with the same general form and sculpture, but the columella is not at all reflected, partly to cover the umbilicus. Diam., max. 10·1 to 10·9 mm.; min. 9·1 to 9·5 mm.; alt. 7·5 mm.—T. D. A. COCKERELL."

In the "Arkiv f. Zoologi," xvi, no. 29 (Nov., 1924), Dr. Odhner describes a new *Truncatellina* as *T. sundleri*, which has been found by Mr. Sundler near Krageholm in Sweden. Shell, jaw and radula are well figured, and the radulæ of *T. costulata* Nilsson, *T. monodon* Held and *T. cylindrica* Fér., are also figured for the sake of comparison. The differences, both radular and conchological, between the new species and the three above mentioned are clearly and concisely pointed out. Dr. Odhner took the opportunity of examining the types of Westerlund's *Pupa odontostoma* and found that they were absolutely identical in every detail with *Truncatellina cylindrica* Fér., and that in spite of the specific name the mouths of the three examples of *odontostoma* show no trace of teeth whatever. He concludes :—"What induced its author to describe it as toothed remains a puzzle, of which the solution, however, lies outside the sphere of Malacology."

Probably most people saw notices in the press of the stranding of a large squid on the Yorkshire coast at Withernsea last January. The P.Z.S., 1925, pp. 291-301 contain a very full account of the specimen, with photos, by Mr. Robson. It is referable to the rare species *Sthenoteuthis caroli* Furtado, and when fresh measured 7 ft. 1½ ins. in length. This is only the fifth recorded specimen of *S. caroli*, three having occurred on the Portuguese coast in 1887 and one at the Faeroe Isles in 1892, and it is, therefore, the first record for British waters. A second example, apparently dead and similar to, but slightly smaller than the above, was reported three days later at Tunstall, four miles north of Withernsea, but was washed out to sea.

The following information as to the whereabouts of Jeffreys' own copy of his great work is important to put on record :—"J. G. Jeffreys' own interleaved set of the volumes of "British Conchology," (to which allusion is made at the beginning of the Supplement in vol. V of that work), is now preserved in the basement of the Radcliffe Library at the Oxford University Museum, having, as I am informed by the assistant-librarian, Mr. Ford, been presented by the author's daughter, Mrs. W. J. Sollas, on June 14th, 1919. The volumes are very copiously annotated by the author, and contain between their leaves numerous notes and letters from his conchological correspondents, and it has therefore been thought desirable to draw attention to their whereabouts, in the belief that this may not be generally known.—A. E. ELLIS."

Mr. Robson, in the P.Z.S., 1924, pp. 589-686, has a very important contribution towards our knowledge of South African Cephalopods. The collection here dealt with was made by Dr. Gilchrist on the Natal coast and off Cape Town, and contains 33 species, whereof ten are new to science and one is a new generic type. Of *Todaropsis eblana* Ball 23 examples were dredged off Cape Town in from 67 to 126 fathoms; after a detailed examination of arms, tentacles, suckers, gladius and

radula Robson was unable to find any constant difference between Cape and Northern forms of this species; such points of difference as do occur "are not sufficiently correlated in the same individuals to lead one to think that they were permanent genetic features," nor are they large enough to suggest a varietal difference.

Two of our members at least are exhibiting collections of mollusca at this year's Wembley Exhibition—Colonel W. H. Turton has one of Port Alfred marine shells in the South African section, and Colonel A. J. Peile one of Bermuda shells in the Bermuda section.

The following extracts from Mr. R. Winckworth's collecting experiences in the East are of particular interest. So very little is known of the habits and habitats of tropical marine mollusca that every item bearing on these is worth putting on record, especially when the observations have been made by an experienced marine oecologist. "In Madras shell-collecting is simple: a brown lad goes into the surf, sweeps a hand-net in the sand and returns with a cargo of shells—masses of live *Donax*, *Sunetta*, *Bullia* and other common things, and a scattering of other species. We got over 50 species. . . . Cannanore on the east coast is as near as I shall get to a south sea island, sea on three sides, warm surf bathing, and coconut groves. We bathed in bathing dress and sun hats, and scooped sand full of *Donax pulchellus* and *cuneatus*, and of *Bullia melanoides*, with great fleshy feet protruding. Every wave uncovers hundreds and they burrow in, to be rolled out again a few seconds later. We also wandered round the rocks, picking *Nerita*, *Mytilus viridis* and countless *Ostrea cucullata*. . . . Some interesting beachcombing at Tuticorin: blocks of coral full of *Magilus*, *Lithodomus*, *Venerupis*, *Cypricardia*, *Martesia* and *Jouannetia*, though all dead. . . . Colombo shore work so far—*Patella*, *Littorina undulata* and another, *Sistrum* (?), *Thais rudolphi* and probably *tissoti*, *Trochus radiatus* all common on rocks."

The "Annals of the South African Museum," vol. xx, pp. 237-308, comprise a most exhaustive monograph of the South African species of the genus *Onchidella* Gray, by Mr. H. Watson, with a series of beautiful plates, a map to show the geographical distribution of the genus and a list of the known species. *Onchidella* occurs in such widely separated regions as Alaska, New Zealand, Tierra del Fuego, West Africa and Cornwall. Mr. Watson concludes that *Onchidella* is possibly much older than most genera of pulmonate slugs, and has had time to become more widely distributed. It is exceptionally adapted to a varying environment, and has the power of living for a month or more either under water—when it respire through the skin, or in the air (if not too dry), breathing mainly through the lung.

Major M. Connolly has just given us another of his admirable faunal studies, entitled "The Non-Marine Mollusca of Portuguese East Africa," published in the Trans. Roy. Soc., South Africa, xii, pt. 3, pp. 105-220, with 5 plates. The author has been fortunate in securing the co-operation of Mr. H. Watson, and to him are due many text-figures and four of the five plates, illustrating the copious anatomical details which he supplies throughout. Altogether 154 species are listed for this area, of which 68 are so far peculiar to it. The author notes that it is "a half-way house between South and Central African forms. From Delagoa Bay, in the south, hardly a species is recorded which is not also common to the Transvaal or Natal, but north of the Beira railway southern forms become inconspicuous or disappear, and the larger species are more characteristic of the fauna of tropical Africa than of the more temperate southern part of the continent."

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It is believed that students of the Mollusca will find material of value to them in these volumes, whether they are interested in species of the world, or in those of a local fauna.

In the later volumes the fossil forms also, of the genera dealt with, are classified and listed.

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WANTED—In Exchange, South American Land and Freshwater Mollusca, not already in collection. — J. R. LE B. TOMLIN, 23, Boscobel Road, St. Leonards-on-Sea.

T H E

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NOTES ON A COLLECTION OF NON-MARINE MOLLUSCA
FROM THE ISLANDS OF THE INDIAN OCEAN.

By M. CONNOLLY.

(Read before the Society, May 2nd, 1925).

THROUGH the kindness of Dr. J. Stanley Gardiner, of Cambridge, and H. C. Burnup, of Pietermaritzburg, fine collections made on the Island of Rodriguez in 1918 by H. J. Snell and H. P. Thomasset, and by the latter at other times in neighbouring islands, have been entrusted to me for report. Very little has been written for many years in the English language on this fauna, but the whole of it has been most elaborately treated by Germain in his magnificent work, 'Faune Malacologique terr. et fluv. des Iles Mascareignes' (Paris, 1921), to which I am indebted for much assistance in the preparation of this paper.

I deal with each island separately, in so far as I have any remark to make about it.

(i) RÉUNION.

Genus **Gonidomus** Swainson.

In 1840 Swainson founded a subgenus of *Helix*, which he called *Gonidomus* (type *H. pagoda* Fér.)¹ and two subgenera of *Pupa* named *Plicadomus* (type *P. sulcata* "Chemn.")² and *Gonospira* (type *P. palanga* "Desh.")³

All these were subsequently grouped by various authors in the Genus *Gibbus* Montf., which is now restricted to *G. lyonetianus* Pallas, or *Gibbulina* Beck, now reserved for South American species. Therefore in 1919, Germain⁴ proposed a new genus, *Orthogibbus*, for the Mascarene group, dividing it into four sections, *Gonidomus*, *Plicadomus*, *Orthogibbus*, s.s. (type *H. modiolus* Fér.), and *Gibbulinopsis* Germain (type *P. pupula* Desh.).

Dupuis, however, has rightly shown⁵ that Swainson's earliest name, *Gonidomus*, has a prior right to the genus name, and further that

¹ Treatise on Malacology, pp. 166, f. 21 and 332.

² l.c., p. 332.

³ l.c., pp. 167, 332.

⁴ Bull. Mus. Paris, xxv, p. 265 and Faune mal. Masc., 1921, pp. 23 and 87.

⁵ Ann. Soc. Zool. Belg., liii, 1922, p. 46.

Germain overlooked Swainson's third subgenus, *Gonospira*, of which, since *palanga* and *modiolus* are consectional, *Orthogibbus* becomes a synonym.

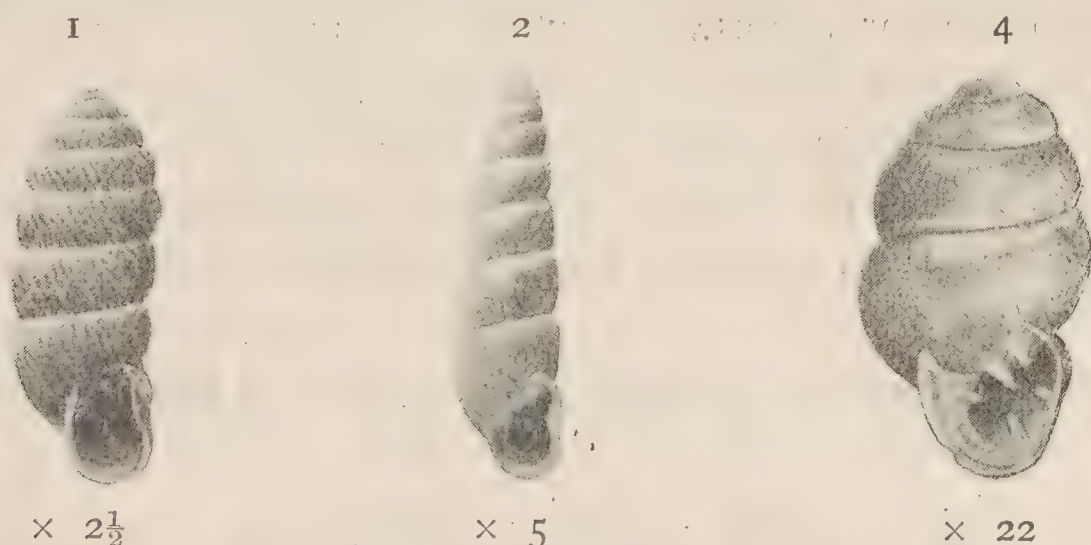
Gibbulinopsis was created for three rather small species from Réunion, *Pupa pupula* Desh., *uvula* Desh. and *turgidula* Desh. There seems no need to separate the last two from *Gonospira*, but in any case the section cannot stand, since its type, *pupula* Desh., is a member of the Pupillidæ, placed by Pilsbry in *Pupilla*. *Gibbulinopsis*, therefore becomes a synonym of *Pupilla*.

(ii) MAURITIUS.

Gonidomus (Gonospira) modiolinus (Morel.).

Text-figure 1.

As this species has never been figured, I illustrate what I believe to be an authentic example from the Morelet collection in the British Museum.



Gonidomus (Gonospira) callifera (Morel.).

Subfossil specimens of this species sometimes attain much greater dimensions than the type, the largest of a set in the British Museum from the Morelet collection, labelled by that author himself, measuring $16\frac{1}{2} \times 8$ mm.

Physa borbonica (Fér.).

If my specimens are rightly identified, this is a true *Physa*, the animal having been examined and proved to be such by H. Watson.

The three species which follow are additions to Germain's list:—

Zonitoides arboreus (Say).

Hab. : Mauritius (Balfour ; Thomasset) ; Curepipe (Connolly, 1910).

Zootecus insularis (Ehrn.).

Hab. : Mauritius (Sir R. W. Rawson).

Mr. Tomlin possesses series of this species from the Rawson collection, both recent and sub-fossil, the former quite typical, the latter of the most obese form to which this very variable shell attains.

Tropidophora eugeniæ (Rve.)

Hab. : Mauritius. Heights of Flacq (Sir D. Barclay), of which more anon.

The following can be deleted from the list :—

Tropidophora insularis (Pfr.).

Germain rightly surmises that this species is not Mauritian. Tomlin possesses Pfeiffer's own working copy of the Mon. Pneumonomorum, in which that author has erased the original locality of "Ile de France" for *T. insularis* and substituted "Port Natal (Mr. Platt)."

(iii) SEYCHELLES.

In 1919 E. R. Sykes¹ published a list up-to-date of non-marine mollusca from these islands and described three new species. This publication has been overlooked by Germain in a list of the same fauna given on pp. 433 to 466 of his great work. The following should therefore be added to Germain's list in order to make it complete :—

Priodiscus martensi Sykes.

Gulella bicolor Hutt.

„ *gardineri* Sykes.

„ *thomasseti* Sykes.

Opeas javanicum Rve. (*O. clavulinum* Pot. and Mich. of von Martens).

O. gracile Hutt.

Cyathopoma blanfordi H. Ad. also

Zootecus insularis (Ehrn.) (Sir A. Gordon, 1875, in British Museum).

To the above I can add another, which seems to be new to science.

Streptostele (Raffraya) mahéensis sp. n.

Text figure 2.

Shell very small, acicular, rimate, thin, smooth, glossy, transparent, vitreous. Spire produced, sides almost straight, apex narrowly rounded. Whorls eight, rather flat, gradually increasing, the first two smooth, remainder sculptured with straight, regular, vertical costulæ, about half the width of the space between them, and becoming much weaker on the last whorl; suture crenulate, impressed. Aperture sub-quadrate, rounded at the base, peristome glossy, thickened and narrowly reflexed; dental processes two, a small, but deeply inrunning plait at the angle of the paries and outer lip, and a broad inward thickening nearly half way down the latter, but without any corresponding external depression; columella erect, with a light inward bulge half way up, margin triangularly reflexed over the rima.

Long. 5.5, Lat. 1.5; apert. alt. 1.0, lat. 0.7; last whorl 2.2 mm.

Hab. : Mahé (Thomasset).

Raffraya acicula (Morelet) from Anjouan is an almost exact miniature of this species, but the localities are not very adjacent, and it may be wiser to consider *mahéensis* specifically distinct. This is the first *Raffraya* to be recorded from the Seychelles or Mascarene Islands. The type is in the Burnup collection.

***Gulella gardineri* (Sykes).**

This species was described from Mahé, the type measuring 6.0×2.6 mm., and Sykes mentions a smaller, narrower form from Cascade, Mahé. Specimens collected by Thomasset on Silhouette I. are remarkably small, their dimensions being only 4.3×2.0 mm.

***Cleopatra ajanensis* (Morel.).**

Von Martens and Germain have chronicled this species from the Seychelles, but Sykes, following Brot, has united it with *Paludomus baccula* Rve., which was described from the Ganges. *Ajanensis*, described from Somaliland, is rather highly spirally striate, and appears to be a true *Cleopatra*, while *baccula* is far more smooth and polished, and agrees with the genus *Paludomus*.

Although the localities are rather distant, it is difficult to separate the Seychelles examples in the British Museum from *ajanensis*, but they are probably quite distinct from *baccula*.

***Paludomus chilinoides* Rve., 1847.**

(=***Melania zeylanica*** I. & H. C. Lea, 1850, ***Paludomus phasianinus*** Rve., 1852, and ***P. fulguratus*** Dohrn, 1857.)

The foregoing synonymy has been published by Brot and others, and is well known. However, *zeylanica* and *phasianinus* have been recorded from the Seychelles, on the authority of the Cuming collection. There seems to be no later record of these Indian forms having been collected there, and the Cumingian localities in regard to them are probably erroneous.

(iv) RODRIGUEZ I.

The collection made by Snell and Thomasset on this island is a very fine one, adding considerably to our knowledge of its molluscan fauna. Nothing has been written thereon in the English language since 1879, when Smith reported the results of the Transit of Venus Expedition, so the present occasion seems favourable for giving a revised list.

Except where there is no doubt as to the synonymy of certain species, I am retaining specific rank for those described from Rodriguez

even when Germain has treated them as synonyms or varieties of others described from Mauritius, but am stating his opinion of them without prejudice.

Unless otherwise mentioned, all the following species are represented in the Snell-Thomasset collection.

Gonaxis distortus (Jonas).

G. pyriformis (Pfr.).

The record of both these species from Rodriguez is based on shells from the Cuming collection in the British Museum. I fully agree with Germain that the locality is almost certainly erroneous, and that they must be deleted from the Rodriguez list.

Gonidomus (Gonospira) palanga (Fér.).

The British Museum possesses a single example of this species, from the Transit of Venus Expedition, said to have been collected on Rodriguez by Slater; it is in recent but poor condition, and may probably have been imported by some means from Mauritius.

Gonidomus (Gonospira) metableta (Crosse).

„ „ **rodriguezensis** (Crosse).

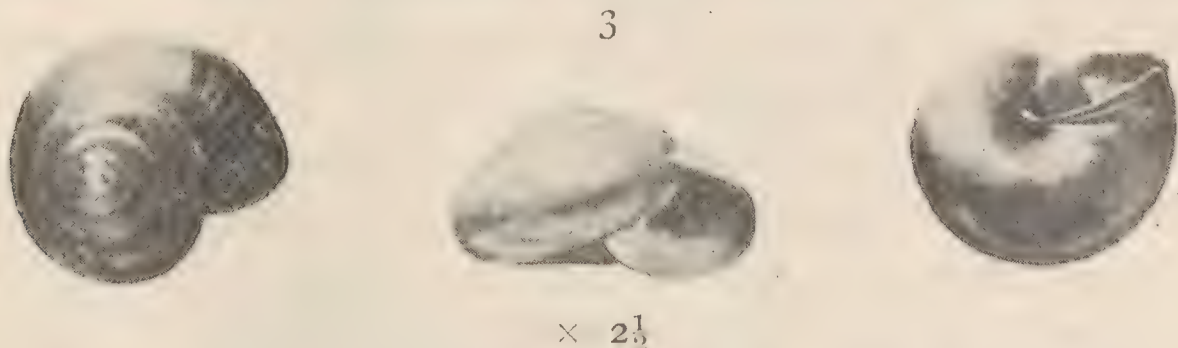
Germain considers *metableta* to be practically identical with the Mauritian *G. modiola* (Fér.), and *rodriguezensis* to be a var. *minor* of *G. modiola* var. *mauritiana* Morel. His deductions are very probably correct, but the Rodriguez shells, appear, on the whole, to be divisible into very clearly defined series, without, so far as I have seen in fairly long sets, any obvious intermediate, so that it may be as well to regard them as distinct.

Gonidomus (Gonospira) chloris (Crosse).

Gudeëlla snelli sp.n.

Text figure 3.

Shell small, subglobose, narrowly umbilicate, thin, polished, transparent, corneous yellow-brown. Spire moderately elevated. Whorls $5\frac{1}{4}$, rather gradually increasing, flattish above, but very round at the periphery, beautifully sculptured above right into the apex with close,



× $2\frac{1}{2}$

regular, spiral lines, about 17 on the third whorl, formed by microscopic punctate dots, so close together as to be almost continuous on the earliest whorls, and then becoming further apart; below the periphery these incised spiral lines are closer together and continuous;

there is practically no transverse sculpture; suture very shallow. Aperture irregularly lunate, hardly descending at base, peristome simple, acute, outer lip descending sharply from the suture, gradually receding to the base in a gentle, regular curve; columella weak, much inclined to the left, upper margin very narrowly reflexed, scarcely overhanging the narrow umbilicus.

Diam. maj. 7.9, min. 6.8; alt. 4.3; apert. alt. 2.8, lat. 3.7 mm.

Hab. : Rodriguez I. (Snell and Thomasset).

Type in Cambridge Museum.

It is somewhat strange to find *Gudeëlla* in this new habitat, but the general appearance of the new species is altogether that of the African genus, and its sculpture is also that of *Gudeëlla*, and not similar to that of any Mascarene species known to me.

***Ariocælatura bewsheri* (Morel.).**

A fairly frequent sub-fossil species.

***Ariocælatura rodriguezensis* (Crosse).**

Collected by Snell in sub-fossil state in company with *A. bewsheri*, as well as in recent condition.

***Eulota similaris* (Fér.).**

The unbanded form, plentiful.

***Gastrocopta lienardiana* (Crosse).**

***G. desmazuresi* (Crosse)**

The last was not in the Snell-Thomasset collection.

***Nesopupa rodriguezensis* sp.n.**

Text figure 4.

Shell minute, acuminate ovate, rimate, smooth, semi-transparent, moderately glossy, dark corneous brown. Spire moderately produced, sides convex, apex bluntly rounded. Whorls $4\frac{1}{4}$, rather convex, gradually increasing, apex smoothly granulate, remainder, under fifty-fold magnification, similarly granulate and sculptured with regular, nearly straight, fine, slightly oblique transverse striolæ, a little less than half as broad as the space between them; suture deep and simple. Aperture subquadrate, rounded at the base, peristome whitish, very slightly expanded, outer lip nearly straight and perpendicular in profile, but conspicuously sinuate in plan just below the suture; dental process five-fold; a short blunt plait at the angle of the paries and outer lip, and a much longer one, parallel to it and much more deeply inset, in the centre of the paries; a conspicuous denticle, equally deeply inset, running out towards the point of the latter from the base of the sinulus; a longer denticle, more deeply inset and slightly inclined to the left, just to the right centre of the base, and a

shorter one, nearly as deeply inset and slightly inclined toward the base, a little more than half way up the columella, which is weak, erect, slightly concave, with margin broadly expanded, but not obscuring the rima.

Long. 1.3, lat. 0.75 mm.

Hab.: Rodriguez I. (Snell and Thomasset).

The type has been presented by H. P. Thomasset to the British Museum.

In view of the numerous insufficiently described and poorly figured species of *Pupillidæ* recorded from the Mascarene Is., I am very chary of adding to their number. However, careful study of Pilsbry's Manual, vol. xxv, seems to show only one, *N. minutalis* (Morel.), from Mayotte, which can be compared with the Rodriguez shell. The following points from Pilsbry's description of *minutalis* should be found, on comparison with mine of *rodriguezensis*, to establish what must surely be specific difference between them.

In *minutalis*:—

(a) The surface is dull, with some irregular striation.

(b) The angular lamella is quite low, forwardly diverging from the parietal and joining, or almost joining, the outer lip.

(c) The parietal lamella is high.

(d) There are two quite short palatal folds; the upper palatal is sometimes very small.

N. bisulcata rhodesiana Pilsb., from the Victoria Falls, appears to resemble more closely the new species, but is larger, with stronger sculpture and longer denticles.

***Achatina panthera* (Fér.).**

An addition to the Rodriguez list.

***Veronicella rodericensis* (Smith).**

***Succinea mascarenensis* Morel.**

(=*nevilli* Crosse).

***Planorbis rodriguezensis* Crosse.**

***Melampus fasciatus* Desh.**

***M. lividus* Desh.**

These two species of *Melampus* were not found by Snell and Thomasset.

***Omphalotropis tæniata* Crosse.**

***O. littorinula* Crosse.**

(=*hamilliana* Crosse).

Germain considers *littorinula* and *hamilliana* to be varieties of the Mauritian *multilirata* Pfr. He is probably right as to their connection

with *multilirata*, but it is quite impossible to separate the two Rodriguez forms as varieties, as every intermediate exists between them.

***Tropidophora articulata* Gray.**

***T. pulchra* Gray,
var. *desmazuresi* Crosse.**

A pretty little shell, not in the S.-T. collection.

***Tropidophora eugeniæ* (Rve.).¹
(=*Cyclostoma bipartitum* Morel.).²**

Described in recent condition from Mauritius, *T. eugeniæ* is identical with *bipartitum* Morel., which was founded on half bleached sub-fossils from Rodriguez, where live specimens, agreeing with the type of *eugeniæ*, were collected by Snell and Thomasset.

It is a beautifully coloured and sculptured shell, with strong, close spiral costæ cutting equally close transverse striæ, the ground colour ranging from brownish yellow to dark pink, with both darker and lighter transverse flames and spiral bands, of which the latter are occasionally altogether lacking.

***Tropidophora bewsheri* (Morel.).**

Not collected by Snell and Thomasset. A sub-fossil species, which may prove to be identical with the foregoing.

***Tropidophora* (*Ligatella*) *fimbriata* Lam.**

(=*hæmastoma* Anton).
var. ***rodriguezensis* (Crosse).**

***Plotia scabra* (Müll.).**

***Melanoides tuberculatus* (Müll.).
(=*rodericensis* Smith).**

***Melanoides commersoni* (Morel.).**

***Truncatella teres* Pfr.**

***Theodoxus gagates* (Lam.).**

***T. Longispina* (Recl.)
(cum var. *despinosa* Mouss.).**

***Smaragdia viridis* (Linn.).**

Not in the S.-T. collection.

***Septaria borbonica* (Bory).**

(v) THE ALDABRA-COSMOLEDO GROUP OF ISLANDS.

These Islands are situate north-west of Madagascar and north-east of the Comoros, between long. 45° and 47° East and just north of lat. 10° South.

¹ P.Z.S., 1857, p. 209, pl. 27, f. 1.

² J. de C., xxiii, 1875, p. 26, pl. 1, f. 3.

I cannot trace records of any non-marine shells from them except that of *Rhachistia aldabræ* (Mts.).¹ Thomasset's collection is therefore of special interest in that it adds several species to this fauna, although none appear to be undescribed. The full list is as follows:—

Gulella (Molarella) gwendolinæ (Preston).

Hab. : Aldabra I.

This species was described from the Shimbi Hills, Kenya Colony, and has since been collected at other inland localities in Africa, and at Gazi, on the coast south of Mombasa; the type measured 5.0×1.5 mm.

The shells from Aldabra agree in every respect with the mainland form except that they are infinitesimally narrower and from $\frac{1}{2}$ to $\frac{3}{4}$ mm. shorter; it is, however, quite impossible to separate them.

Gastrocopta tripuncta (Morel.).

Hab. : Aldabra and Cosmoledo Is.

As stated by Pilsbry in his Manual,² and evidenced from his figures, there can be extremely little difference between this species and *G. seignaciana* (Crosse and Fischer), which was described from Nosse Bé, while *tripuncta* hails from the Comoro Is. The series from the Aldabra group appear slightly nearer *tripuncta*, if there is any specific difference.

Rhachistia aldabræ (Mts.).

Hab. : Aldabra I.

Succinea mascarenensis Nev.

Hab. : Grande Terre, Aldabra I.

Isidora forskali Ehrn.

Hab. : Pool of Takamaka, Aldabra I.

Germain figures several examples from Mauritius of very aberrant form, which bear the manuscript name of *Physa spiralis* Fér. in the Paris Museum, but are referred by Germain to *I. forskali*. The Aldabra series agree well with those figures, and differ widely, in their irregular contour, from the more typical form.

Tropidophora (Ligatella) ligata (Müll.).

var. **affinis** Sow.

Hab. : Menai and Cosmoledo Is.

The shells agree well with Germain's description of Mauritian examples, which he attributes to this variety. They are of small size, about 13 mm. high and 11 broad; the spiral striation round the umbilicus is entirely absent in most specimens, but faintly discernible in others.

¹ Mitth. Zool. Samml. Mus. Berlin, 1898, I, p. 28, pl. 2, f. 15-16.

² Man. of Conch. xxiv, pp. 128-131, pl. 23.

Assiminea punctum Morel.

Hab. : Aldabra I.

A. parvula Morel.

Hab. : Aldabra, and possibly also Menai and Cosmoledo Is.

While some of the Aldabra shells are undoubtedly *parvula*, some from the same island and the others mentioned above may possibly be referable to a different species, but the material is insufficient for present action.

Truncatella valida Pfr.

Hab. : Aldabra.

(vi.) COMORO Is.

Two names given by Morelet to species of *Gulella* from these islands are preoccupied, and I cannot find that they have ever been replaced. The first is *Gulella vitrea* (Morel.)² which is later than the same author's *Ennea vitrea*¹ from Angola. The latter is now placed in *Marconia*, but, as both were described as *Ennea*, the Comoro shell must be renamed; I accordingly christen it *Gulella transnominata*.

The second is *G. comorensis* (Morel.),³ which, although described as a *Pupa*, is a *Gulella* of the section *Uniplicaria*, and is preoccupied by *Gulella comorensis* (Mts.).⁴ I rename Morelet's species *Gulella mayottensis*.



Vertigo moulinsiana in Middlesex.—In the valley of the Colne, just below Harefield Church, the Grand Junction Canal is bordered by a wide belt of reed-grass (*Glyceria aquatica*). Here, on October 11th of this year, a day of drizzling rain, I collected about thirty specimens of *V. moulinsiana*. All were crawling on the foliage of the *Glyceria* and of *Iris pseudacorus*. None of them were in the water, and most of them were two or three feet above the swamp, unlike the associated *V. antivertigo*, which I found only on the sodden and decaying vegetation at the water level or just above it. The other associated molluscs were *Agriolimax laevis*, *Euconulus fulvus*, *Zonitoides nitidus*, *Ashfordia granulata* and *Succinea elegans*. Harefield is some eight miles higher up the valley than Colnbrook, where Mr. J. E. Cooper found *V. moulinsiana* in 1906 (*J. of C.*, vol. xii, p. 19). At that place, too, it was living in a bed of *Glyceria*, and not, so Mr. Cooper tells me, in a reed-bed, as he inadvertently stated in his note.—CHAS. OLDHAM (*Read before the Society*, Nov. 5th, 1924).

¹ *Ennea vitrea* Morel., Voy. Welwitsch, 1868, p. 84, pl. 2, f. 3.

² do. do. do. —J. de C. xxxiii, 1885, p. 296, pl. 14, f. 12.

³ *Pupa* (*Gibbulina*) *comorensis* Morel., J. de C., xxxiii, 1885, p. 293, pl. 14, f. 3.

⁴ *Ennea comorensis* von Martens, Jahrb. D. Mal. Ges., iii, 1876, p. 252, pl. 9, f. 5.

WAS CLAUSILIA BIDENTATA Auct. DESCRIBED BY STRÖM?

By FRIDTHJOF ÖKLAND.

(Read before the Society, January 7th, 1925).

FOR a long time the species here considered has been dealt with under various names. In Northern Europe, especially, most malacologists have called it *Clausilia bidentata* (Ström), referring to the old name and description of the Norwegian pastor Hans Ström. In Germany and Switzerland, too, some have used the said name. Almost all English and French authors, however, have designated the species either as *Clausilia rugosa* Draparnaud or as *Clausilia nigricans* (*Cl. nigricans* Pulteney, erroneously for *Cl. nigricans* Maton and Rackett; vide Kennard and Woodward, 1923, pp. 298-300). It remains to be said that very often the Northern European form is interpreted as a separate species, called either *Cl. bidentata* or *Cl. nigricans*, in contrast to a more southern *Cl. rugosa*.

As a matter of fact our species in the course of more than a hundred years has not received a generally accepted name. A few years ago Kennard and Woodward (1920, pp. 84-85) tried to solve the question, claiming that the *Turbo bidentatus* of Ström was an indeterminable species, and that the name should be abandoned, "since the original description and figure might equally well apply to such other form as *Cl. parvula* Studer." However, the latter does not occur in Norway. In the following I will try to demonstrate that the name put forth by Ström should not be rejected. Perhaps it is not wholly unnecessary to mention that I do not claim the strict accomplishment of the laws of priority in all cases. However, it is here not the purpose to dig out a dusty priority, but to decide in favour of one of two current names. This question may be dealt with without entering upon the problem mentioned above; does there exist a separate, more southern species, the *Cl. rugosa* Drap., of many authors, or should this form be united with the more northern one, *Cl. nigricans*=*Cl. bidentata*, into a single species?

The diagnosis and description of Ström (1765, pp. 436-437) may be quoted here: "*Turbo (Bidentatus) testa turrita pellucida; anfractibus contrariis; apertura bidentata margine reflexo.* Dette Navn tillægges jeg den lille Land-Snegel som her forestilles Fig. XVII. Den er af Længde som en Nægel, og af Skabning som en omdreiet Naver, med ni eller ti Ringe eller Omdreielser, gaaende fra höire op ad til venstre Haand saaledes, at de efterhaanden tage af i

Tykkelse. Aabningen er i den ene Ende rund, men i den anden lidt rende-agtig, samt rundt omkring omgivet med en lille tilbage böiet Kant. Indentil paa venstre Side (forstaae, naar Snegl-Huset sættes ordentlig paa sin Aabning), har den to smaa Tænder, eller ophöiede og tynde Kanter, der strække sig fra Aabningens Kant op ad. Skjællet er temmelig fast, men dog igjennemsigtigt. Farven bruun eller graa, og Ormen en sort-blaa Snegel. Den opholder sig tilligemed de tvende efterfølgende blant Mosse paa Biergene."

In order to form a rational opinion in the matter here concerned it is important to have a knowledge of the Norwegian *Clausilias* and their distribution. From 1913 I have made investigations as to the distribution of the Norwegian snails and slugs. To this enquiry, the results of which will soon be published, each species has been mapped out.

Like many others of the old diagnoses and descriptions, those of Ström are not patterns. Neither is the figure referred to in accordance with modern requirements. Like the other illustrations on the same plate, the figure represents the natural size of the animal, i.e. 10×2.3 mm. Among the Norwegian species of the genus, this length could apply to *Clausilia plicatula* Drap., *Cl. pumila* Ziegler, *Cl. cruciata* Studer and *Cl. bidentata* Auct.

The description cannot be founded upon *Clausilia plicatula* for the following reasons:—Although a length of 10 mm. may not rarely be met with, the specimens are always broader than 2.3 mm. Only seldom are the 2-3 folds of the spatium interlamellare absent; they are so conspicuous that I should think they would have been observed if the description had referred to this species. The term "pellucida" of the diagnosis does not suit *Cl. plicatula* well. Lastly, the distribution is of importance. The species is chiefly restricted to the south-eastern part of Southern Norway, between 59° and 61° N. Lat. In western Norway it is only known from Lærdalsören in Sogn (Stoll 1899, p. 44) and from Bergen (Friele, 1853, p. 26). Now the investigations of Ström were restricted to the latter part of the country, to "vestlandet" up to the year 1775. Thus the very distribution seems to indicate that the description must be founded upon another species.

Clausilia pumila, too, must be put out of the question. The length nearly always exceeds 10 mm. and the breadth never decreases to 2.3 mm. Further, it is more fusiform than Ström's figure. As to its occurrence, it is very rare in Norway and was never recorded from the western part of the country. It is mentioned from three places:—Ekeberg, near Kristiania, (Westerlund, 1873, p. 213); Langesund (Esmark, 1886, p. 112); and from the neighbourhood

of Skien (Jensen, 1873, p. 172). The last locality must be rejected, as Jensen's specimen proves to belong to *Cl. bidentata*; it is preserved in the Töien Museum at Kristiania.

Both Ström's description and figure could apply to *Clausilia cruciata*; only the mode of occurrence "blant Mosse paa Biergene," i.e.:—In moss in the mountains, would not be a good characteristic of a forest species like this.

But *Cl. cruciata* was never found in that part of the country which Ström investigated till 1775. The few specimens which are known from Norway were found at Veisten in Gausdal (Westerlund, 1873, p. 608), further at Lillehammer and Grue (not previously published; found by the author of these pages). There is practically no probability that Ström found *Cl. cruciata*.

Clausilia bidentata Auct. is the only Norwegian *Clausilia* to which we can refer Ström's description and figure, considering the distribution of the species belonging to this genus. The said species is to be found in large numbers in most parts of Norway. It occurs everywhere except in the central and the most northern parts of the country. We must conclude that this form was really the one described by Ström.

LIST OF PAPERS REFERRED TO:—

- 1886.—B. ESMARK: On the Land and Freshwater Mollusca of Norway.—*Journal of Conchology*, vol. 5, pp. 90-131.
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THE DISTRIBUTION OF MARGARITANA MARGARITIFERA IN THE BRITISH ISLES.

By J. WILFRID JACKSON, M.Sc., F.G.S.

(Presidential Address delivered at the Annual Meeting, October 25th, 1924).

PART II.

IN Part I of this address (*antea*, p. 195) I have dealt with the salient features of the pearl mussel and with its recorded distribution in the British Isles. The period of its arrival into these islands and the means whereby the species attained its distribution may now be considered. It will be quite impossible to do full justice to these interesting questions, as the whole subject involves us in a discussion of events which took place before, during and after the Glacial Period. We have to take into consideration the vexed question of climate, and the presence or absence of land-connexions aiding or otherwise in the spread of the species, and the still further important question dealing with the survival of the molluscan fauna in the British Isles.

Space cannot be spared to enter fully into a history of the origin and migrations of the species of mollusca now inhabiting these islands, though this cannot be legitimately separated from a discussion of this character. Much difference of opinion exists regarding our fauna as a whole. Some authorities believe it to be of a mixed character, i.e., partly pre-glacial, glacial and post-glacial¹; others seem to think that part may be glacial and part post-glacial; while others maintain that it is entirely post-glacial in origin.

In connexion with these points the freshwater pearl mussel formed an important item in Dr. R. F. Scharff's lucid and interesting works dealing with the history of the European and American Faunas.² It has also been the subject of an important memoir by Dr. Bryant Walker,³ who has elucidated its history and distribution in the North American continent.

That the species is a very ancient one has already been emphasised; but the exact age and the centre from which it made its migrations are not sufficiently clear. The dearth of fossil examples adds considerably to the difficulty in these matters.

It is conceded by most authorities to be an immigrant into Europe. Dr. Scharff, in the works already cited, is strongly in favour of a North American origin. In his "European Animals"⁴ he expresses the opinion that the species found its way to Europe along a

¹ See especially Forbes, *Mem. Geol. Surv.*, vol. 1, 1846, p. 399.

² R. F. Scharff, "European Animals," 1907; and "Distribution and Origin of Life in America," 1911.

³ B. Walker, *Proc. Malac. Soc.*, vol. ix, June 1910, pp. 126-145, and Map (pl. ii).

⁴ R. F. Scharff, *op. cit.*, 1907, pp. 34-36.

continuous coast line from North America via Greenland and Iceland to North-Western Europe, together with three freshwater sponges which occur only near the west coast of Ireland and the east coast of America. In further substantiation of his claim he refers to the presence in America of other allied species of the pearl mussel.

In the case of the freshwater sponges, later researches have shown that the supposed three species of North American origin are but local forms of a single species, viz., *Heteromeyenia ryderi* Potts. This is found in freshwaters of non-limestone areas, and is not confined to the west of Ireland, as was at first thought, but occurs in the north and south, as well as in the east. It is also recorded from the Island of Mull, Scotland.¹

Against the conclusion of the North American origin of the pearl mussel Dr. Bryant Walker² brings forward many cogent arguments. He finds it difficult to accept Dr. Scharff's verdict, and submits that from the available data as to the distribution of the species the following inferences may be deducted :—

1. That it is not probable that the species originated in North America.
2. That it is probable that it did originate in Asia.
3. That its presence on the western coast of North America is due to a migration in Miocene or early Pliocene times from Asia over the Behring bridge, or perhaps even earlier.
4. That its occurrence on the east coast of North America is best explained by a similar immigration from Europe over the Greenland bridge.
5. That there is no evidence to show that it was an inhabitant of Central British America in pre-glacial times.
6. That there is reason to believe that the causes which, since the Glacial Epoch, have prevented it from invading that region were equally efficacious in restricting its western range before that time, and that it consequently was not exterminated in that region by the Glacial ice-cap, for the reason that it was not there to be exterminated.

When two such authorities as the above disagree, it is difficult for one like myself to bring forward anything in the nature of a decision one way or another.

There are one or two points, however, which might be elucidated. The first is with regard to the so-called allied species of the pearl mussel in America. At the time when Dr. Walker's paper was published, three other American species were included in the genus

¹ Jane Stephens, Proc. Roy. Irish Acad., vol. xxxv, Sect. B, No. 11, Sept., 1920, pp. 205-254, pls. xxvi-xxix.

² B. Walker, *op. cit.*, p. 139.

Margaritana, viz., *hembeli*, *decumbens* and *monodonta*. It was pointed out by Walker at the time that *hembeli* was the most aberrant member of the group, differing from all the other species by the plicate dorsal area. It has since been discovered by Dr. Ortmann¹ to be a *Ptychobranhus* and not a *Margaritana*. With regard to the others, too little is known of *decumbens* to base an opinion on.² The type and only known specimen comes from the Alabama drainage system, and is perhaps related to *monodonta* from the central United States. Walker expresses the opinion that it is possible that both these species may belong to an entirely different stock, and more extended knowledge may necessitate their removal from *Margaritana*. H. Hannibal, in 1912,³ also points out that *monodonta* differs in important particulars from *margaritifera* in the adolescent shell—a certain indication of heterogeneous origin—and should doubtless be separated as a distinct genus. We are thus left with *margaritifera* as the only true living representative of the genus *Margaritana* in America, and its presence on that continent might be attributed quite reasonably to a migration from the Old World, as maintained by Walker.

Before leaving the American evidence, attention might be called to records of fossil occurrences. The true pearl mussel has been reported from the Quaternary deposits of Utah (Bonneville Lake beds) and from Nevada (Lahotan Lake beds). It has also been cited from the Tejon Formation (Eocene) at Tesla, Cal., by Hannibal;⁴ but later research by this authority on more perfect material has proved the species in question to belong to a distinct genus and species, viz. *Pseudunio herrei*.⁵

In the Old World several other species have been described under the genus *Margaritana*, but most of these have since been transferred to other genera, or have been relegated to the rank of varieties of *margaritifera*.

In addition to *M. crassa*, of Southern Europe, cited by Walker,⁶ and which is a true *Unio* with well-developed cardinal and lateral teeth,⁷ two others may be mentioned, viz., *M. laosensis*, known only from Cambodia and Burmah, and *M. freytagi*, from Nassau, Germany.

In the case of the south-eastern Asia *laosensis*, closer study is required. It is said to be a somewhat smaller species than *margaritifera*, but to resemble it closely. The teeth, however, are generally quite well-developed.⁸ My excuse for bringing this species into the

¹ Fide B. Walker, in litt., 26/6/1911.

² Walker, *op. cit.*, p. 128.

³ Hannibal, Proc. Malac. Soc., vol. x, 1912, p. 121.

⁴ Walker, *op. cit.*, p. 142.

⁵ Hannibal, *op. cit.*, p. 121.

⁶ Walker, *op. cit.*, p. 128.

⁷ Simpson, Proc. U.S. Nat. Mus., vol. xviii, 1896, p. 304.

⁸ *id.* *id.* p. 304.

discussion is because of the fact that it has been thought to be of considerable significance as bearing on the probability of an Asiatic origin of the genus.¹

Margaritana freytagi recalls the var. *roissyi* of *M. margaritifera* in its outward appearance; but seems to possess abnormal lateral lamellæ.²

Until further observations have been made on these forms and more information obtained regarding the recent and palæontological history of the group in Europe and Asia, it is doubtful whether much can be gained by prolonging the discussion on the centre of origin of *M. margaritifera*.

Let us now turn to the British distribution of the pearl mussel and see if there is any evidence of it being an inhabitant of the British Isles in pre-glacial times, or whether it owes its presence here to a dispersal in the post-glacial drainage systems. There is room for much difference of opinion in these matters.

It is generally agreed that the non-marine mollusca have reached these islands from different sources and at varying times. Some are definitely known from the Pliocene, while a great part have been met with in the Pleistocene deposits. Others, however, have only been recorded from the Holocene, or most recent, beds.

It must be remembered that most of our knowledge of the Pliocene and Pleistocene non-marine molluscan fauna of these islands is derived from the east, south-east, and south of England, where the true sequence has been so ably worked out by Messrs. A. S. Kennard and B. B. Woodward. Their conclusions based on the mollusca have been corroborated by a close study of the mammalia by Mr. M. A. C. Hinton.

During the periods in question the above-mentioned area was co-extensive with the continent of Europe, and this extension of land also brought the south of Ireland into indirect connexion with France and the Iberian peninsula. Being largely outside the limit of glaciation during the Glacial Period, there would be ample space to serve as sanctuaries for the fauna and flora to survive throughout this epoch.

There is, therefore, no question as to the pre-glacial age and survival of many molluscan species so far as the southern portion of England is concerned, and, notwithstanding, the absence of fossil records, it seems reasonable to assume that the pearl mussel may be pre-glacial also in Cornwall, Devon, and perhaps Hereford. It does not appear to be a species likely to be influenced by the close proximity of an ice-sheet, since it lives in rivers in Northern Europe which have their origin in snow-waters.

¹ Walker, *op. cit.*, p. 134.

² Kobelt, Rossmäessler's "Iconographie," N.F. ii, 1886, pp. 45-46, Taf. 55, figs. 291-4.

Unless we can be certain of the presence of suitable sanctuaries elsewhere in the British Isles, the glacial survival of any pre-existing species cannot be maintained, and we are obliged to fall back upon the theory of migration after the glacial episode had partially, or entirely, passed away.

As far as can be ascertained from the voluminous literature on the Glacial Period, practically the whole of the British Isles north of the area just mentioned suffered extreme glaciation, and the old river valleys, in most cases, were filled with drift, so much so that the later rivers had to make fresh channels for themselves, either along the old valleys or in a new direction.

Under such circumstances as these it seems impossible for any fauna previously existing in the old rivers to have survived, and the presence to-day of the pearl mussel in so many glaciated areas must be due to late-glacial or post-glacial migration.

Until more detailed work is accomplished it is impossible to indicate many areas in which the necessary environmental conditions prevailed which render it probable that organisms survived the Ice Age.

In addition to the large southern region already mentioned, there are two or three other areas in England which are thought to have escaped glaciation, viz., much of the Pennine Range south of the River Aire; a large area in N.E. Yorks., i.e., the Moorlands of Cleveland; the Cross Fell Range; and the highlands around Weardale, Durham.

It has been shown by Professor P. F. Kendall, F.R.S.,¹ that during the Ice Age the Cleveland Hills formed a large insular and ice-free space, fringed on the north by a series of extra-morainic lakes, of which Lake Eskdale was the most important. Near the village of Lealholm, a moraine extending across the valley and obliterating the old course of the Esk was laid down by an ice-lobe. It is of interest here to recall the fact that the Esk at Lealholm is one of the known stations for the pearl mussel, and one is tempted to postulate a glacial survival of the species in the near-by driftless area.

Another case which might be cited is that of Weardale, in Durham. The pearl mussel formerly existed in plenty in the River Browney (an affluent of the Wear) near Bearpark, N.W. of Durham, but seems to have become extinct through pollution. The drainage area of the Browney appears to have been entirely covered by ice from the Tyne Valley,² thus completely covering the recent habitat of the pearl mussel. At the southern margin of the ice-lobe several glacial-lakes were formed in the valleys on the northern flanks of the highlands

¹ P. F. Kendall, *Quart. Journ. Geol. Soc.*, vol. lviii, 1902, pp. 471-571, Map pl. xxviii.

² A. R. Dwerryhouse, *Quart. Journ. Geol. Soc.*, vol. lviii, 1902, pp. 572-608, Map, pl. xxix.

separating the Tyne Valley from Weardale, and, as in Eskdale, the pearl mussel might be a glacial-survival in one or other of the eastern lakes or streams on the driftless area, migrating into the Browney on the return of favourable conditions.

The occurrence of the pearl mussel in the River Rede, above Otterburn, Northumberland—a glaciated area—may be due, in like manner, to a survival in glacier-lakes or streams on the Cheviots,¹ where the river takes its rise.

But there appears to be some evidence that these systems of glacial-lakes belong to the later period of the Ice Age: in fact, everything points to their being phenomena associated with the retreat of the ice. There is every possibility of the supposed unglaciated regions having been overridden by ice at an early stage.

Assuming that the areas referred to have been untouched by any glaciation, and that the above-mentioned cases are to be regarded as glacial-survivals, it is necessary also to postulate a survival of fishes, in order to serve as hosts for the glochidia.

Excluding the somewhat doubtful cases of the glacial survival of the pearl mussel referred to above, it seems certain that, in the majority of the British stations, the species owes its presence to dispersal since Glacial times.

The Isle of Man provides us with an interesting and most convincing case. Leading geologists have clearly shown that this island was completely overwhelmed by the Ice Sheet, so that whatever life existed there in pre-glacial times must have been swept away. This island, therefore, has been re-populated in late-glacial or early post-glacial times, and the pearl mussel is clearly a migrant here after the withdrawal of the Ice Sheet. The river in which the species occurs in the Isle of Man is, no doubt, the remains of a former tributary of a river flowing to the south across a drift-filled plain, now occupied by the shallow eastern portion of the Irish Sea. In all probability, the other pearl mussel rivers in this region, such as the Irt in Cumberland, the Lune in Lancashire, and the Conway in North Wales, formed part of the same drainage system.

There is abundant evidence to show that the Isle of Man was connected with the mainland after the retreat of the ice, thus providing a way for faunal and floral migrations. H. Donisthorpe² has recently given some extremely interesting and important evidence on this point. In recording the presence for the first time at Colby Glen, Isle of Man, of the little myrmecophilous woodlouse *Platyarthrus hoffmanseggii*, he points out the utter impossibility for this crustacean

¹ P. F. Kendall & H. B. Muff, *Geol. Magazine*, 1901, p. 513-515.

² Donisthorpe, *The Entomologist's Record*, vol. xxxvi, 1924, p. 74.

to have reached the island except by a land-bridge after the disappearance of the ice. As emphasised by Dr. Scharff,¹ in his account of the distribution of this species, it is difficult to conceive that this creature, from its peculiar mode of life, could have crossed any formidable barrier, such as even a narrow straits of sea. One is tempted to give more details of this interesting species, but this is beyond the scope of this address. Attention, however, might be called to its present distribution. Since Dr. Scharff published his map showing the geographical range of this woodlouse in Europe,² many additional records have been made in England and Wales. It is not confined, as was thought, to the south of England, but extends through the Midlands to Durham, Lancashire, Cheshire, Flintshire, and Denbighshire. In Ireland it appears to be recorded only from the south and south-east. Its discovery, therefore, in the Isle of Man, forms an important link between north-western England and Ireland.

There is great diversity of opinion as to whether there was a land connexion between Great Britain and Ireland after the Glacial Period. By some authorities it is thought that the accumulation of glacial deposits on the floor of the Irish Sea may have been so great that only a small uplift was needed, in early post-glacial (or late glacial) times, to unite Wales and Ireland, and Scotland with the North of Ireland.³ It has been suggested also that part of the area between the Isle of Man and Ireland was occupied by a lake, with a river draining out of it, southwards down what is now the St. George's Channel.

Though this land-connexion does not appear to have been of long duration, it was doubtless sufficient to enable many species to spread westwards into Ireland.

Dr. G. H. Carpenter⁴ has expressed an opinion which supports my own conclusions. He believes that after the Glacial Period many animals, which had doubtless lived in the south of England and Ireland from Pliocene times, spread northwards along the shores of the ever-widening "St. George's Channel" gulf to their present situations on the eastern Irish and western British shores. "North of this," he believes "the vast majority of our present widespread species passed from north-western England into Ireland, where they have spread from east to west." In this conclusion we have, I think, the ready means whereby the pearl mussel was enabled to spread into the river-systems of the Irish Sea basin, at least.

It is necessary here to make a few observations on the origin of the Irish Non-Marine Molluscan Fauna. This subject has been dealt

¹ Scharff, "The History of the European Fauna," London, 1899, p. 300.

² Scharff, "European Animals," 1907, p. 6, fig. 1.

³ Jukes-Browne, "The Building of the British Isles," 3rd ed., 1911, p. 460.

⁴ G. H. Carpenter, Natural Science, vol. ii, 1897, p. 385.

with in recent years by A. S. Kennard and B. B. Woodward.¹ Their paper contains a wealth of detailed observations on the molluscan remains from caves, chara-marls, raised beaches, kitchen-middens, etc., in Ireland. The authors also discuss the difficult problems as to the origin and distribution of this fauna. From a consideration of all the available data they express as their opinion that with two or three exceptions, possibly accidental introductions by man, all the species (about 80) existed in Ireland in pre-glacial times and survived the Glacial Period; also that there has been no land connexion between Great Britain and Ireland for a considerable period, and certainly not since Glacial times.

I regret that I am unable to subscribe to these views. None of the shells dealt with in their paper appear to me to give emphatic support to the conclusion advanced that the Irish Non-Marine Mollusca, as a whole, is pre-glacial, since all the deposits which have yielded specimens (with the doubtful exception of some caves) are definitely post-glacial. Many deposits, in fact, can be certainly dated as Early Holocene (i.e., Campignien or Early Neolithic). With regard to the cave deposits, only five species of mollusca are classed as of Pleistocene age. Four of these are from the Kesh Caves, Co. Sligo; but it should be pointed out that in the clay below the shell-level a large glaciated block of limestone was found, thus suggesting a post-glacial age for the shells and associated Lemming remains.² The fifth species (an immature *Helix aspersa*) is from Ballinamintra Cave, Co. Waterford. This species, it may be remarked, appears for the first time in the Upper (or Late) Pleistocene in S. W. England.

I am prepared to admit the possibility of many of the species having reached Ireland in what is generally known as the Late Pleistocene, but it will be necessary to discuss this in order to make the position quite clear.

The most important and best-known Late Pleistocene deposits containing mollusca are the caves of Ightham, Kent, explored by W. J. Lewis Abbott; Langwith, Derbyshire, examined by the Rev. E. H. Mullins; Dog Holes, Warton, Lancashire, investigated by the writer; a fissure deposit at Chudleigh, Devonshire, examined by A. S. Kennard; and Aveline's Hole, Burrington Combe, explored by the Bristol Spelæological Society. The first three deposits are interesting as being situated on a line reaching from S.E. to N.W. of England, and the fauna obtained from all three, including the small mammalia such as Lemmings, Voles, etc., is essentially similar. Ightham is certainly an unglaciated area; Langwith appears to be a

¹ Kennard and Woodward, Proc. Geol. Assoc., vol. xxviii, 1917, pp. 109-190.

² See Report British Association, 1902 (1903), pp. 248-9.

driftless area; but the Warton cave is situated right in the middle of an area which has suffered extreme glaciation, and the field evidence here was all in favour of the deposit being post-glacial in age.

Opinions differ very largely as to the relation of the Late Pleistocene to the period of the major glaciation of Britain. It has always appeared to me a reasonable assumption that the latter episode could be correlated much closer with the later part of the Middle Pleistocene, i.e., the Crayford Stage of the Middle Terrace of the Thames than with anything subsequent. That glacial conditions continued in places in the Late Pleistocene may be granted, but I am inclined to regard this period as one of minor glaciation, when large areas previously covered by ice were laid bare.

Leading authorities agree that during the Late Pleistocene period Britain was united to the continent, the bed of the North Sea being dry; and it is maintained by some that Ireland, the Hebrides, and the Orkney Islands, were also connected with Britain. Under such conditions the way was clear for the various species to extend their range, according to habit and habitat. I believe that it was at this time, as glacial conditions were passing away, that the pearl mussel spread out from areas untouched by the ice-sheets, and gradually attained its present distribution in the British Isles. Somewhat similar events must have occurred in other places inhabited by the pearl mussel on the continent of Europe. The abundant presence of the species in Finland, for example, is undoubtedly due to post-glacial migration.

These tentative conclusions are submitted with due deference to other workers who hold very different opinions regarding the period of the Maximum Glaciation of the British Isles; but I believe that the interpretation which I have suggested may bring into harmony the views held by so many geologists, zoologists, and botanists, in favour of the post-glacial age of the greater part of our fauna and flora, the term post-glacial being interpreted as post-Maximum Glaciation.

ADDENDA.

Since Part I of this Address was printed I have received an interesting communication from H. H. Bloomer, adding two further localities to the list of recorded occurrences. He writes that two years ago he took twenty specimens of *M. margaritifera* at Clungunford, from the river Clun, a tributary of the river Teme. They were all dead shells. Live specimens could not be found, though, for several reasons, the dead shells could not have travelled more than one hundred yards down stream—the water was too deep to investigate it properly. Mr. Bloomer also tells me that five or six years ago he found one valve at Brimfield, near Woofferton, in the river Teme. I find that Streeter mentions the river Clun but without precise locality (see E. W. Streeter, "Pearls and Pearling Life," London, 1886, pp. 238-9.).

CORRIGENDUM.

Part I, p. 211, line 4, Herefordshire should be Hertfordshire.

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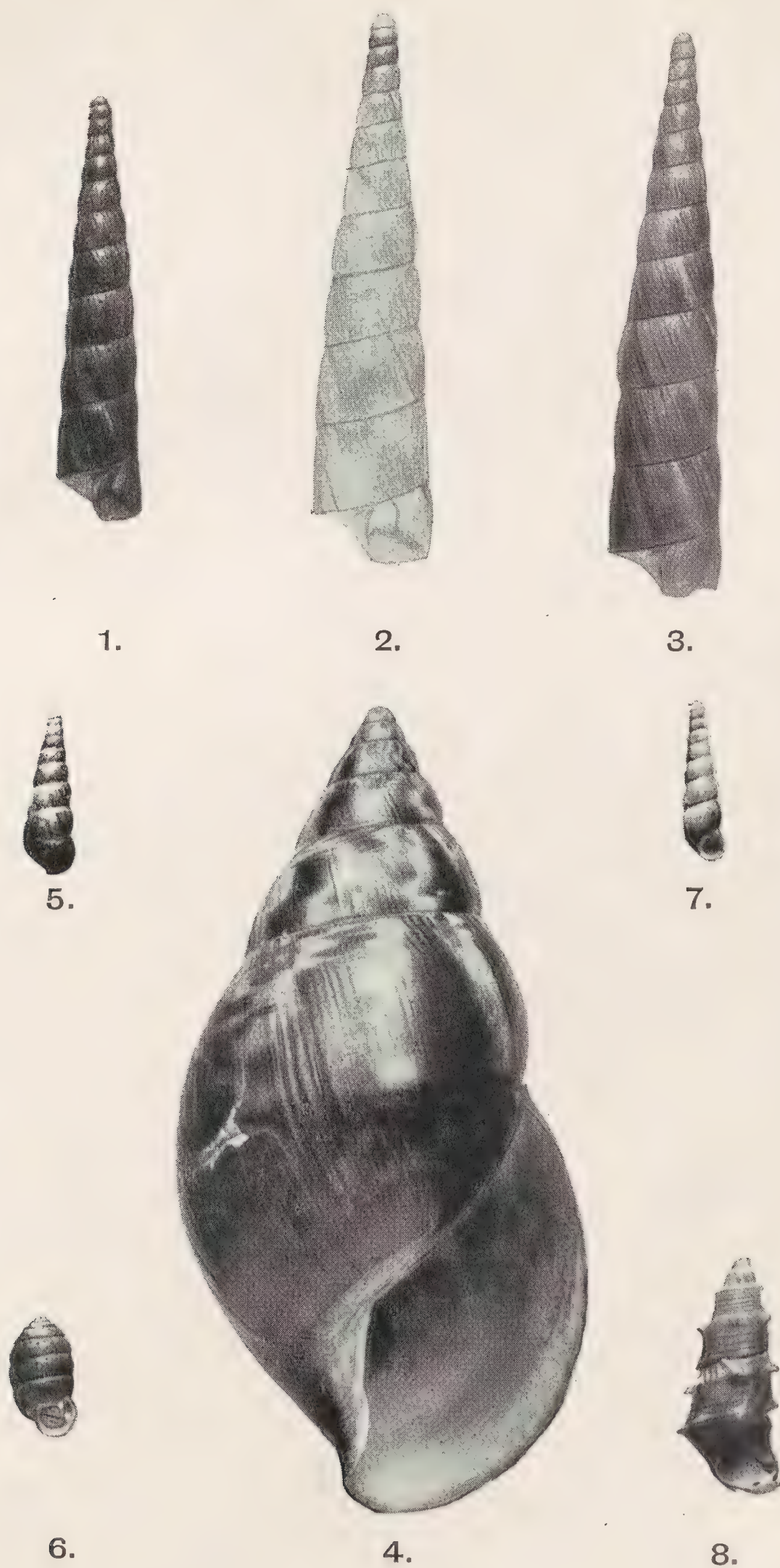
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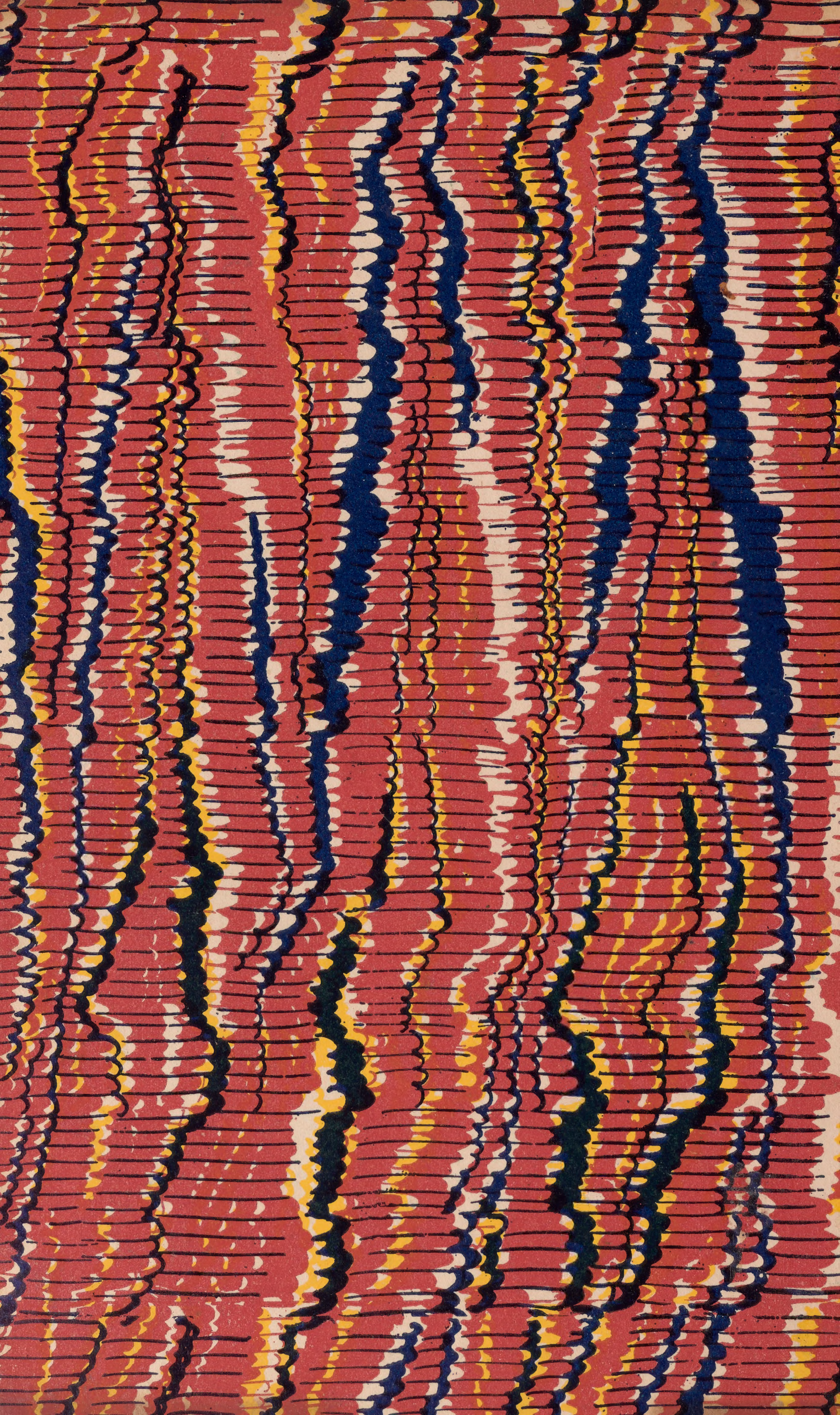
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